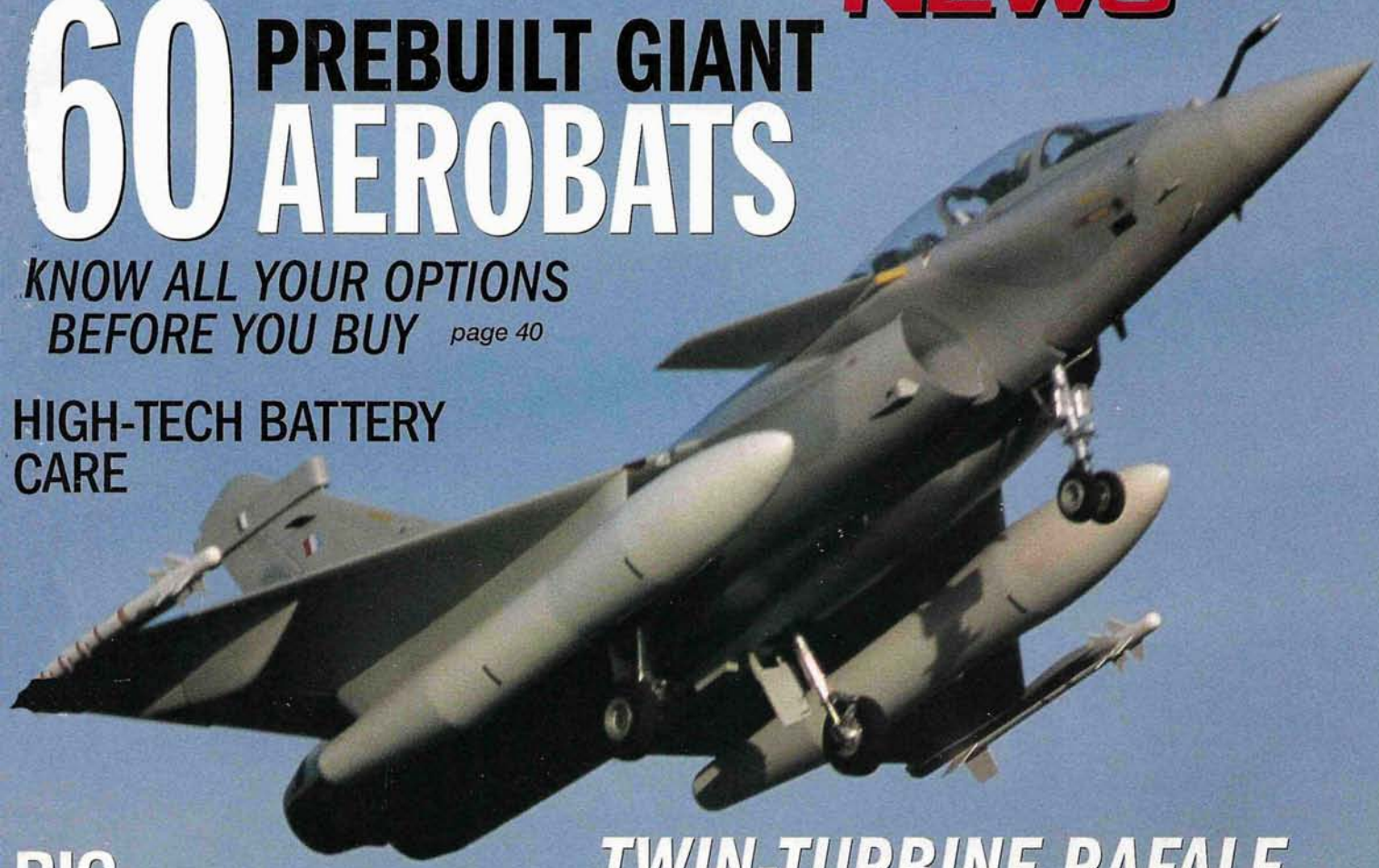
EXPERT ADVICE! EASY-TO-USE LATEX PAINT FOR ALL MODELS

MODEL Airplane NEWS

60 PREBUILT GIANT AEROBATS

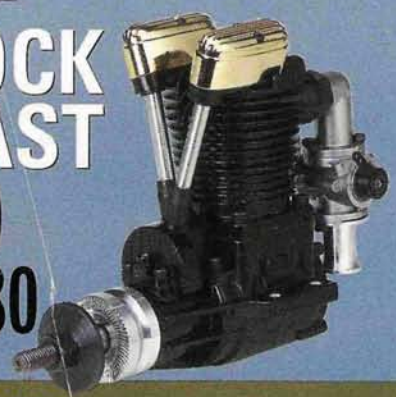
KNOW ALL YOUR OPTIONS BEFORE YOU BUY page 40

HIGH-TECH BATTERY CARE



TWIN-TURBINE RAFALE WINS SCALE MASTERS

BIG-BLOCK BEAST SAITO FA-180



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REVIEWED

- J-3 Cub–in military colors
- Park Razor–electric foam flying wing
- Silky Wind–electric nostalgia
- Elster–prebuilt glider

48120

MODEL Airplane NEWS

APRIL 2001 • VOLUME 129, NUMBER 4

p. 32

ON THE COVER: *Terry Nitsch's beautifully detailed Rafale, built from a Bob Violett Models kit, placed first at the U.S. Scale Masters (photo by Jerry Nelson). Insets: Chris Chianelli checks out the Saito FA-180 in his "Air Power" column; you'll want to head to the lake after reading Jim Onorato's review of the Kyosho PBY Catalina ARF.*

Features

Construction

Field & Bench Reviews

Columns

Departments

Instant IMAC

The popularity of high-performance, aerobatic planes and the high quality of today's prebuilt models have converged: now it's easier than ever for the experienced modeler to try his hand at precision aerobatics without having to invest unlimited time and energy in building his own aircraft. In this month's IMAC guide, you'll find fully covered and almost-ready-to-cover, large aerobatic designs. If you're in the market for an IMAC aircraft, read the article on page 40 before you buy.

With the "explosion" of small—and large—electric-powered models, there are so many new types of batteries on the market that it can be confusing to keep the care and feeding of each straight. This month, Bob Aberle takes the mystery out of battery choice and maintenance and helps you get the most life and flight duration out of your battery packs. The future of electric flight is wide open; just look at the ever-increasing availability of park- and slow-flyer designs. If you'd like to join the "quiet revolution," Bob's comprehensive and informative article is a great place to start (see page 78).

If you thought that latex was good only for painting your workshop walls, think again: it's perfect for spray-painting sport and scale model airplanes. In this issue, expert modeler Roy Vaillancourt explains why latex paint can be used, even on glow-powered models. The advantages? It's inexpensive, environmentally friendly, doesn't give off noxious fumes and is easy to clean up. Better still, your local paint store can perfectly match your desired color. Read more on page 70.

Scale Masters contestant Mike Barbee flew his impressive WACO to second place.

Four-stroke engines continue to grow in popularity—especially those big-bore, single-cylinder beasts. The designers at Saito have taken the 4-stroke to new heights with their FA-180. This "torquey" powerhouse swings an 18x6 APC prop at nearly 9,000rpm. Check out Chris Chianelli's "Air Power" column on page 110 for more details.

Those of you who have been putting off your next (or your *first*) big scale project need only to turn to Jerry Nelson's coverage of the U.S. Scale Masters for inspiration (see page 32). Held at Wright-Patterson Air Force Base in Dayton, OH, the event featured the country's best scale models. Terry Nitsch's breathtaking Rafale twin jet ... Nick Ziroli Jr.'s Dauntless ... Mike Barbee's classic WACO ... these (and others) are certain to motivate the scale enthusiast inside all of us.

MODEL Airplane NEWS
FOUNDED 1929

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Member Audit Bureau of Circulations
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AIRWAVES

Our readers write back

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA; man@airage.com. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous number of letters we receive, we cannot respond to every one.

ENGINE SIDE THRUST

First, thank you for giving such honest and excellent reports and articles. Great job! I try to read every issue of most modeler magazines, and you're the best. Keep it up! I would love to see an article relating to engine-thrust angles. It seems that most models have about 3 degrees of offset built into their firewalls, but what exactly is the reason for this? Is there a factor for better performance with 2 degrees versus 5 degrees? Why is it to the right? What about pushers and twin-engine aircraft? Some local modelers even say not to use any thrust offset at all. Maybe you could address these questions for me.

MICHAEL REIMAN
Palm Beach, FL

Michael, the topic of engine side thrust relates to correcting (or at least minimizing) engine torque. As the engine spins the propeller (counterclockwise, as seen from in front of the model), torque tries to veer the model to its left. Adding right thrust helps offset this torque-induced left turn and helps the model stay on a straight course. For most .40- to .60-size airplanes turning a 10- or 11-inch prop, 2 to 3 degrees of right thrust offset seems to be the norm. The more torque an engine produces, the more offset it needs. For pushers, the offset is also in the opposite direction of the torque force. For twin-engine aircraft, engine offset helps during takeoffs and during potential engine-out situations. Although there are many opinions about which setup is best, most designs have 0-degree of offset on the left engine and 2- to 3-degrees right thrust on the right engine. But, as with most airplane setups, the exact amount of offset is determined by the model's own characteristics. Trial and error is needed to dial in any plane. GY

MORE TISSUE COVERING TIPS

I enjoyed Dave Robelen's excellent article on covering with tissue (February 2000 issue), and I am about to put it into practice on a Speed 400 electric Super Cub. Is Elmer's school gel significantly different from Elmer's white glue? Should they be diluted to save weight? Regarding tissue-grain versus shrink: as I read your instructions, the grain should go on the wing cord, not the span. Is this correct? Is Krylon Crystal Clear lacquer recommended even on an electric motor (no fuel or oil)? Can you explain why you shouldn't wrap tissue around the corners on the fuselage? Is lacquer recommended on small, light parts? Thanks for an excellent (and timely, for me) article and your answers to my questions. [email]

DICK ERRATT

You're welcome; glad you liked the article. To answer your questions: the school gel dries faster and is simpler to dispense. The white glue also works fine if the other is difficult to find. I don't dilute either one, but I do spread them thin. The tissue grain should cross the chord. This gives less sag between ribs. Lacquer weighs very little and, except for indoor flying, it stabilizes the tissue and makes it moisture-proof. Since tissue is a paper product, it will bend only one way at a time. Wrapping it around the frame would promote wrinkling. Also, if you use colored tissue, overlaps should be avoided because of the color-density difference.

DAVE ROBELEN

POKEY PLAN, PLEASE

Is there a plan available for Pokey, the model that Dave Robelen used in his tissue-covering article? I really liked the design's appearance and simplicity. I've been looking for a rubber-to-RC conversion project, and Pokey looks like a good place to start. With a little guesswork and a ruler, I think I could draw up a copy of

the airframe from the article, but I'd still be in the dark as to the RC gear.

Which motor, prop, gearbox, servos, ESC, receiver and battery pack did you use? Experimenting with micro gear is an expensive proposition, so knowing what works in Pokey would give me a good start. [email]

GEORGE KUEHN

You're in luck, George; due to popular demand, my Pokey model will be featured in an upcoming Model Airplane News *construction article. It's equipped with 3-channel control for flying in really tight quarters. I am using a WES-Technik DC5-2.4 motor and gear set (and am quite fond of it). There are other power options among electric motors. In fact, by the time you read this, there will probably be still more possibilities. This is also true of the RC equipment; new and lighter hardware appears almost weekly. For my installation, I chose Hitec HS-50 servos and then trimmed away the excess from the plastic case. I used the Hitec Feather receiver and 7-cell, 50mAh Ni-Cd battery pack. I also used an ESC from Sky Hooks and Rigging and an ARC-1 prop from Anything RC. For more information, check out the* RC MicroFlight *newsletter at www.rcmicroflight.com (or call [800] 243-6685 to subscribe).*

DAVE ROBELEN

MICRO-FLIGHT FANS

I am an RC flyer, given to flying large glow- and gasoline-powered models. Recently, my closest flying buddy and I decided to look at the world of micro flight and come out of the cold, perhaps! We have both built the little Pico Indoor J 3-S models. I have flight-tested mine, and we are waiting for our next opportunity to fly indoors.

I have devoured the current and all back issues of *RC MicroFlight*. You have done a great job of assimilating the data and packaging it for readers to pore over. I can already see that there are many paths to follow: micro light, indoor, outdoor, hybrid, innovative combinations—the list goes on. I also see that I must add a park flyer, and your articles have let me see some trade-offs.

Thanks again. I look forward with great interest to joining this group. [email]

JIM GRIFFIN

AIR SCOOP

BY CHRIS CHIANELLI

New products or people behind the scenes: my sources have been put on alert to get the scoop! In this column, you'll find new things that will at times cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you, the reader, who matters most! I spy for those who fly!

7-foot Cessna

Aviomodelli continues the tradition of the American workhorse with its Cessna Cardinal. It features sheeted wings, fin and stabilizer and a Duraflex fuselage and cowl, and it comes with all you need to take to the air. The package includes a fuel tank, spinner, wheel pants, scale radio antennas, Pitot tubes, passenger steps and detailed color decals. Specs: wingspan—84 inches; length—61 inches; weight—9.5 to 10.5 pounds; wing area—2,109 square inches; engine req'd—.60 to .91ci 2-stroke, or .80 to 1.20ci 4-stroke.

Hi Country Hobbies, 614 West Denver Ave., Gunnison, CO 81230; (800) 862-7196; www.rcmodelairplanes.com.

N'WST WACO

A new biplane in Ikon N'wst's inventory of kits is this ⅕ scale WACO YKS-6. It was chosen for its history and beauty, and Ikon bills the YKS-6 as one of its nicest kits ever. In the late 1930s, the YKS-6 was virtually unmatched aesthetically, and Ikon has honored the history of this fine plane with

the detail appropriate to a vintage type. Although it isn't officially an aerobatic airplane, with its four ailerons, it will roll with the best of them. Specs: wingspan—78.5 inches; wing loading—21.2 ounces per square foot; wing area—1,632 square inches; weight—15 pounds; engine—1.20ci to 1.50ci 4-stroke.

Ikon N'wst, 3806 Chase Rd., Post Falls, ID 83854; (800) 327-7198.

NEW AGE FOR WATTAGE

WattAge has introduced a bunch of new products for 2001, and the Sporty and the Cub-400 electric-powered ARFs caught my eye. The Sporty is a 28-inch, 11- to 12-ounce, foam aerobatic park flyer; it includes a Speed 280 motor and gear drive and all the hardware needed for any of three control setups. The Sporty can be flown with 4 channels: rudder (R), elevator (E), aileron (A) and throttle, or as a 3-channel with R/E/T, or A/E/T.

The new Cub-400 is an all-wood sport-scale rendition of the universally loved Piper J-3. It has a flat-bottom airfoil with a 46.5-inch span, and its all-up weight of just 1.4 pounds gives it a low wing loading for gentle, controllable performance. A direct-drive Speed 400 motor such as the 380 available from WattAge provides plenty of power. Seven to 8-cell 500 to 800mAh batteries provide ample run times, and it has lots of rudder authority for flying in tight areas. All the hardware is included, and a sticker sheet is all that's needed to finish this Cub.

Give Global a call and grab one of these new WattAge designs. Better yet, order both and spend all summer at your local park enjoying the benefits of quick and easy e-power.

Global Hobby Distributors, 18480 Bandilier Cir., Fountain Valley, CA 92708; (714) 962-0827; fax (714) 962-6452; www.hobbypeople.net.

Sig's formulas for success

No single fuel is ideal for every engine type. That's why the folks at Sig have come up with these fuels. The 4-Stroke Synthetic was designed specifically for (you guessed it!) 4-stroke airplane engines, which run better with a little less oil than comparable 2-strokes. It's available with 10 percent nitro ($17.99 a gallon) and 15 percent nitro ($19.99 a gallon); both contain 18 percent blends of Klotz synthetic racing lubricant. Sig's Terminator 2000 formula is similar to the 4-stroke's in both nitro content and oil percentage, but it is designed for 2-strokes, so AA castor oil is used with the Klotz. The 10 percent costs $18.99 a gallon; the 15 percent costs $20.99.

TIGER BLEND

4-STROKE SYNTHETIC

Tiger Blend is specifically for big-bore engines such as the SuperTigres 2000 through 4500. It features a 10-percent-nitro mix and a 10-percent-oil content of blended Klotz and AA castor and costs $17.99 a gallon.

TERMINATOR 2000

FUELING THE HOBBY

Sig Mfg. is celebrating its 50th anniversary this year, and the people there wanted to do something to thank their customers and make sure the hobby stays strong for the next 50 years. To that end, they have created the "Fuel 4 Fields" program. For every gallon of Sig fuel bought by members of AMA or MAAC flying clubs, Sig will donate 50 cents to that member's local club. See your local hobby shop or the Sig website for more details.

Sig Mfg. Co. Inc., 401-7 South Front St., Montezuma, IA 50171; (800) 247-5008; fax (641) 623-3922; www.sigmfg.com.

"High-lift" floats

Sea Commander's new fiberglass, gull-wing floats were a huge success at the last giant Shuswap Float Fly. The new design tunnels the flow of water back through a 12-degree step, allowing the plane to pick up speed and take off more quickly. A sharp, built-in chine on the front outboard edges eliminates the need for spray rails, and its flat-top design incorporates a band of core mat that runs two-thirds of the way along the top surface. This allows modelers to choose any simple, sport mounting system. The floats range in length from 36 to 46 inches, are pressure-checked for leaks and come completely joined with airtight bulkheads. You can also get a package that includes an optional spreader bar. As a bonus, the floats are shipped with drawings of simple mounting systems.

Commander R/C Models, Langley Airport #7-5333-216 St., Langley, British Columbia, Canada V2Y 2N3; (604) 514-3027; (604) 514-3028; www.seacommander.com.

Storm watch

Many WW II enthusiasts know Vailly Aviation's line of Hawker fighters well because of the success of the Hurricane, Sea Fury and Tempest. Now, Roy Vaillancourt brings us the latest addition to the Hawker family of kits—the Hawker Typhoon MK 1B. Vailly held nothing back for this giant-scale warbird, which is completely constructed of lite-ply, balsa and spruce. Everything except the rudder is built up and sheeted with 1/16-, 1/8-, or 3/32-inch balsa. If you really want your Typhoon to stand out, you can hook it up with any of the available Vailly accessories, including a fiberglass cowl, a clear plastic canopy, an aluminum spinner with a machined-aluminum backplate, formed-plastic elevator shrouds and landing-gear door liners, dummy exhaust stacks or cannon shrouds. The retracts pictured here are Vailly Aviation's Robust Retracts, which were designed especially for the Typhoon, but the plans are easy to modify to accommodate any retracts you want. Specs: wingspan—97 inches; length—79.75 inches; radio req'd—4- to 6-channel.

Vailly Aviation, 18 Oakdale Ave., Farmington NY, 11738-2828; (613) 732-4715.

SILENT Wulf

Looking at this beautiful 47-inch wingspan, 16.7-ounce, Kevlar-reinforced fiberglass Focke-Wulf from Marky's Hobby Shop, you'd never guess just how easy it is to put together. This plane is the newest addition to Marky's line of Super Class electric ARFs, and it comes painted, detailed and complete with markings just as you see it here. All the control surfaces are hinged and all the pushrods are installed. The wing and elevator are attached with a single screw; Speed 600 power gives it the speed and vertical climbing ability to match its looks. The folks at Marky's will even supply their Turbo 10 motor/gear-drive combo to get your Wulf tearing up the skies in no time. The price of all this performance, beauty and convenience? How about $279?! (motor combo costs extra).

Marky's Hobby Shop, (732) 263-0750 or (732) 539-8002; fax (732) 263-0751; www.Parkflyers.com.

Horsepower is like money: you can never have too much of it.

RAM AIR for your model!

And when you get an engine that runs more smoothly and produces less mess in the bargain, you know you have a winner. In this case, I'm referring to the Power Ram velocity stack from B&B Specialties. Hot-rodders have used velocity stacks for 50 years to hop up car engines, and the principle works just as well for model airplanes. The key is to create a positive airflow through the carburetor. As a result, fuel mixes better, so there isn't any siphoning of raw gas; that means no residue around your carb to mop up. It also smoothes the airflow and allows your engine to turn more rpm, and that means more power! More consistent airflow also ensures a more positive engine response through all flight maneuvers. The Power Ram is precision-machined from aluminum stock and comes in two pieces: the velocity stack and the retaining ring.

B&B Specialties, 14234 Cleveland Rd., Granger, IN 46530; (219) 277-0499; www.bennetbuilt.com.

Ballfield fighter

If you're one of those guys who thinks all backyard flyers are spindly, twig-and-tissue contraptions, then check out this Micro Mustang—a pint-size P-51D. Not everyone is looking for the "relaxing" performance of the average park flyer; if you like an occasional dose of adrenaline , this fierce little fighter is just the ticket to quicken your pulse and put a smile on your face. Dave Robelen's design has a wingspan of just 17.5 inches and is powered by a DC 5-2.4 motor. It offers scale flight performance with enough speed and agility to keep things interesting. With micro radio gear and a 5-cell 50mAh battery, the plane weighs just 66 grams. A full construction article and plan for this Micro Mustang will appear in an upcoming issue of our companion publication *RC MicroFlight* (www.rcmicroflight.com). With this, all you'll need is a lurking micro Messerschmitt in your neighborhood, and you'll be in the aerial hunt!

Tini 190

For you aerial warriors who are itching for a good showdown, this 1/12-scale Focke-Wulf 190 is the next best—and definitely the safest!—thing. Designed especially for 1/12-scale combat, this plane tracks straight and fast and rolls and turns with a precision that screams "killer instinct." Though it can handle up to a .25ci powerhouse, a .21ci will give it enough power for superb vertical performance. Also, the plane's proven CNC-cut "foam-and-packing tape" construction helps it to survive even the worst midair collisions. Its construction makes the Focke-Wulf perfect for sport flying, too, because it withstands those hard landings, rough treatment and the occasional tree collision. But hey; at $30 a kit, we can afford to have a little reckless fun. Specs: wingspan—35 inches; weight—36 ounces; engine req'd—.21 to .25ci.

JK Aerotech, 10800 SE Orient Dr., Boring, OR 97009; (503) 663-4081.

HINTS & KINKS

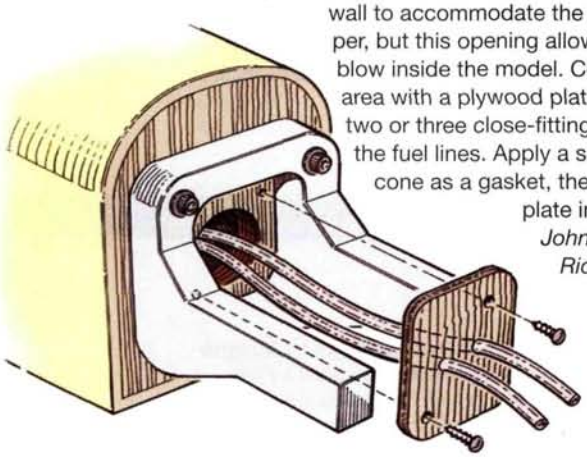
BY JIM NEWMAN

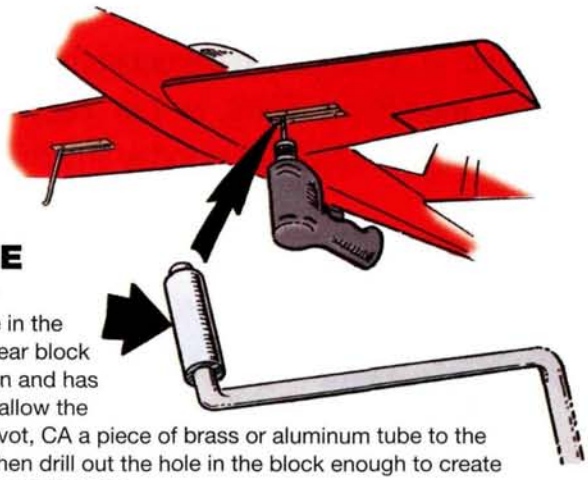
SEND IN YOUR IDEAS. *Model Airplane News* will give a free, one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman, c/o *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.

HOLE IN ONE

Many ARF models have a large hole in the firewall to accommodate the tank stopper, but this opening allows oil to blow inside the model. Cover the area with a plywood plate that has two or three close-fitting holes for the fuel lines. Apply a smear of silicone as a gasket, then screw the plate into place.

Johnny Eanes, Ridgeway, VA





LOOSE LEGS

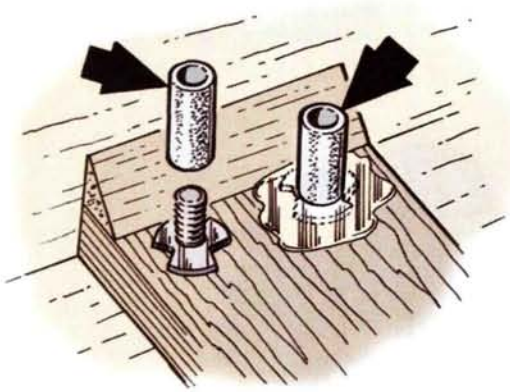
If the hole in the landing-gear block looks worn and has begun to allow the gear to pivot, CA a piece of brass or aluminum tube to the gear leg then drill out the hole in the block enough to create a tight fit over the tube.

Mike Garner, Ponte Vedra, FL

STICKY THREADS

After you pull the T-nuts into place with the screws, force a piece of fuel line or shrink sleeve over the screw threads before you apply the epoxy or CA to the nuts to secure them. This will keep the glue out of the threads so that the screw can be removed.

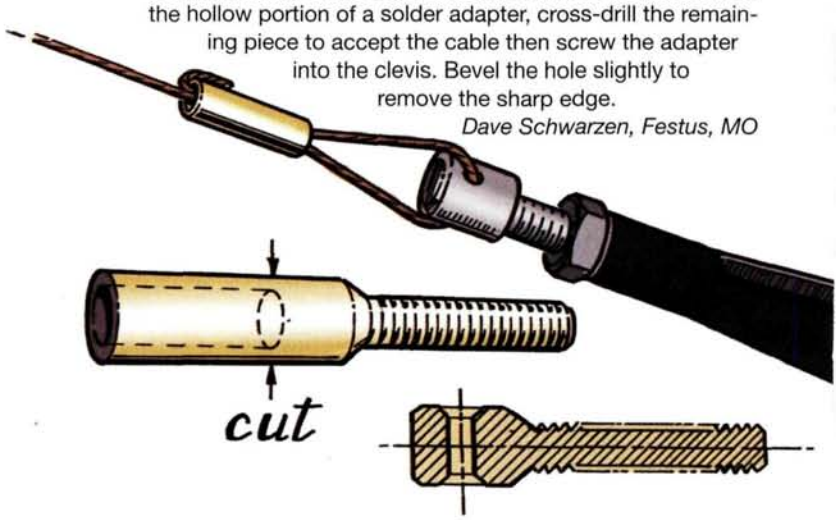
Dick Brundidge, Longville, MN



BIPLANE WIRE TIE

To make a turnbuckle adjuster for a control cable, first cut off the hollow portion of a solder adapter, cross-drill the remaining piece to accept the cable then screw the adapter into the clevis. Bevel the hole slightly to remove the sharp edge.

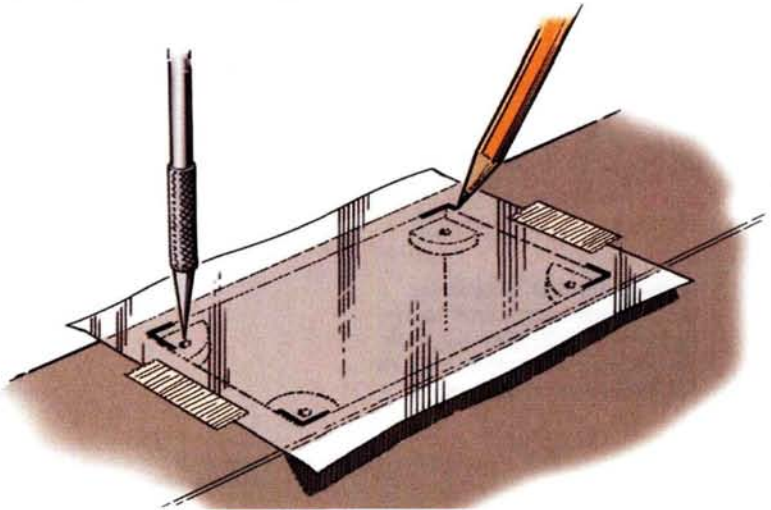
Dave Schwarzen, Festus, MO

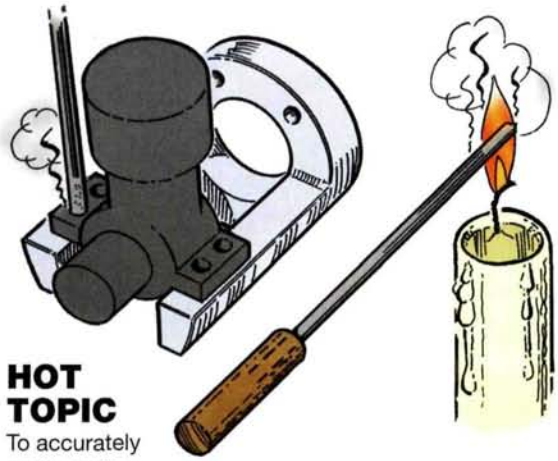


HOLE TEMPLATE

It's easy to determine the hole positions for that flush hatch. Tape a piece of drawing Mylar or clear plastic over the recess and mark the corner positions. Line up the scriber with the screw holes below, then use it to pierce small holes in the plastic. Move the template to your hatch, align the corner marks and pierce holes in the hatch to make drill dimples.

Bill Dinmore, Montgomery, AL





HOT TOPIC

To accurately mark engine-mounting holes in nylon-type engine mounts, select a piece of metal rod or music wire that fits the holes in the engine-mounting lugs. Heat the end of the rod or wire, then, using the lugs as a guide, press it into the nylon.

Art Griepp, Dallas, TX

LABEL MACHINE

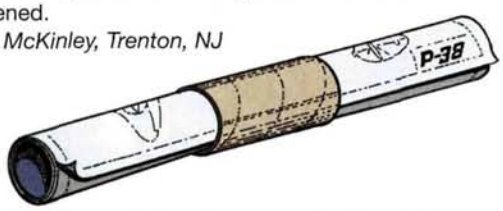
Clip the mailing labels from your junk mail and catalogs. Add your AMA and phone numbers, then glue it in your model where it can be seen, per AMA requirements.

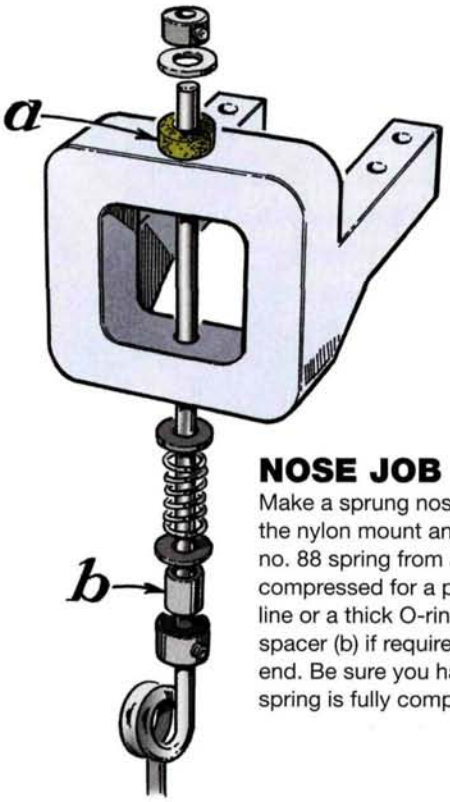
Matthew Pulzman, Clearwater, FL

BUSINESS MATTER

Use the cardboard tubes from toilet tissue or paper towels to keep your plans neatly rolled for storage. They won't deteriorate like rubber bands, nor will they allow the rolled plans to become flattened.

Bart McKinley, Trenton, NJ





NOSE JOB

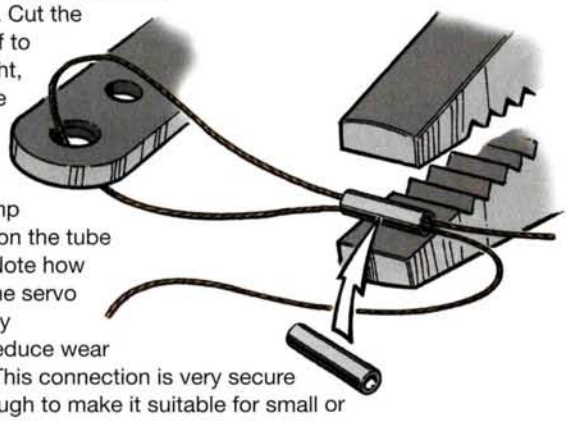
Make a sprung nose gear leg for your model by drilling the nylon mount and assembling the parts shown. Use a no. 88 spring from a hardware store and install it slightly compressed for a preload. Fit a short piece of rubber fuel line or a thick O-ring (a) as a rebound buffer and a tube spacer (b) if required to avoid interference at the bottom end. Be sure you have propeller clearance when the spring is fully compressed.

Terry Barnes, Lithia Springs, GA

FISHY SUBJECT

Use fishing-leader connector sleeves when you install pull/pull control systems. Cut the sleeve in half to reduce weight, then feed the line through the sleeve and servo arm and crimp down firmly on the tube with pliers. Note how the hole in the servo arm is slightly beveled to reduce wear on the line. This connection is very secure yet light enough to make it suitable for small or slow flyers.

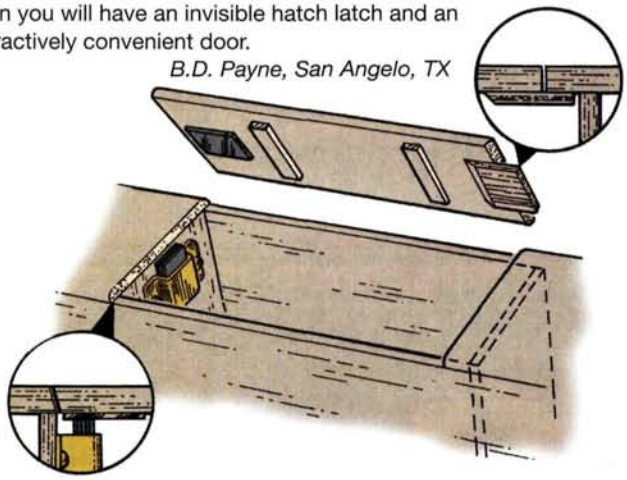
Charles Anderson, Port St. Lucie, FL



HATCH LATCH

To create easy and convenient access to any compartment, simply screw a magnetic latch to the rear bulkhead and glue the steel striker plate under the lid. Affix a piece of plywood to the opposite end of the lid beneath the lip of the forward bulkhead; then you will have an invisible hatch latch and an attractively convenient door.

B.D. Payne, San Angelo, TX



PILOT PROJECTS

A look at what our readers are doing

SEND IN YOUR SNAPSHOTS. ***Model Airplane News*** **is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable. We receive so many photographs that we are unable to return them.**

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of the year. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.

SUPER STEARMAN

Pilots who believe that lighter is better have yet to fly Gary Dennison's 50-pound Balsa USA Super Stearman. Powered by a Desert Aircraft 1.50 and guided with a JR10Sx radio and 615 servos, the plane muscles its way into the sky to offer Gary, of Blue Point, NY, the "most realistic" flight experience he has ever known.

DIVINE PROVIDENCE

This scratch-built SPAD 13 is the creation of George Poirier of Providence, RI. He spent the better part of three years completing the project, using plans from Arizona Model Aircrafters. Though it weighs in at 23 pounds, this plane is a good flyer. It cuts through the sky like a scythe behind its Zenoah G-45, 2.8ci gasoline powerhouse.

CRIMSON 'GENUITY

Bud Carlson of Jamestown, NY, used a *Model Airplane News* plan for the framework of this scratch-built McCessna. However, he used some good ol'-fashioned creativity to give this beauty a personality all its own. Using model helicopter blades, Bud designed a set of weight-balanced, trailing ailerons supported with aluminum rods and reconfigured nylon strut brackets. Counterbalanced with fishing sinkers supported by music-wire rods, the ailerons are also coupled to the rudder for improved turning. A spectacle of ingenuity, this cherry conception is clearly in a class by itself.

SAVAGE SKYHAWK

Dan Savage's Yellow Aircraft A-4 Skyhawk flies out of Rancho Santa Margarita, CA. Driven by a K&B .82 and a Dynamax fan unit with a muffled tuned pipe, this plane is fast yet surprisingly stable. Dan modified his bird with auxiliary wing tanks and a droppable centerline store that uses a Vortac bomb-release mechanism.

GOLDEN BOY

From Kitchener, Ontario, Canada, come Ron Daniels and his House of Balsa de Havilland Chipmunk. Powered by a 6V Speed 400 motor and spinning a 7x7 Graupner prop at over 10,000rpm, this aircraft has the power to climb out of the worst hand-launches, yet it will fly fairly slowly for more relaxed cruising. Ron modified his model by replacing the turtle deck with contest-grade balsa—as well as by drilling lightening holes in the fuselage sides.

WATER FOWL

From Burnaby, British Columbia, Canada, comes this Canadair CL415 Waterbomber—Anton Eisele's own scale creation. Constructed from balsa and ply, this big bird is capable of taking off from land or sea. It draws power for its two Speed 600 motors from 16, 2000mAh Ni-Cd cells. Anton has spent many leisurely Sundays cruising with his masterpiece.

HARTMANN'S REVIVAL

In a past life, the model pictured here was a Kyosho ARF. Michael Bernier of Riverside, RI, removed the skin of the Bf-109E and kit-bashed the fuselage and wings in an attempt to approximate Erich Hartmann's famed Bf-109G-14. Michael altered the vertical fin, redesigned the nose and constructed the oil cooler, cannon blisters and spinner, and he also gave great attention to capturing the minutest details of the original plane's logos and artistry—from the knights' crosses to the kill markings on the rudder. Powering this airborne artwork is a Saito 91 turning a Master 14x7, 3-blade prop.

PICTURE THIS

For his latest kit-bashing project, Jeff Burdick of Ruskin, FL, installed a Supercircuits video camera system and a Canon Elph 35mm camera at the rear of the fuselage of what used to be a stock Kadet Senior. The entire system sits in a box controlled by a second Futaba 4-channel Conquest radio that enables Jeff to tilt and pan the cameras from the ground. Power is provided by a Saito 1.50 GK 4-stroke spinning a Graupner 15x8, 3-blade prop, and the plane carries a Jomar battery backup as well.

SILVER BULLET

It is easy to understand why Joe Casey of Naples, FL, chose the already completed, *white* Globe Swift kit as the litmus test for some new aluminum paint. The plane's appearance alone suggests sleek power and speed. For real power, Joe outfitted this 96-inch model with an O.S. 300 twin. He also added his own style by streamlining the package with Robart retracts and flaps, and he added countless button-head rivets to further emulate that aluminum sheath. Nice work, Joe.

The best of the best compete in Dayton

by Jerry Nelson

U.S. SCALE MASTERS CHAMPIONSHIP

Martin Hendrickson flies this beautiful T-34 Beechcraft to 14th place in Expert.

THE 2000 U.S. SCALE MASTERS CHAMPIONSHIP was held at Wright-Patterson Air Force Base in Dayton, OH, which is also the site of the United States Air Force Museum and the place where the Wright brothers did most of their flying. The runway used for the competition was thousands of feet long, and most of the time the sun stayed behind the pilots; the weather was good, though at times a crosswind challenged the pilots. All in all, it was a great event.

Team Scale first-place winner (for a second time), Graeme Mears holds his Tiger Moth, while pilot Dave Patrick checks the controls. The big British biplane is powered by a Moki twin-cylinder engine.

First-place Expert winner Terry Nitsch (far right) accepts his award. Terry flew his super-impressive Rafale B-01 turbine-powered jet that he built from a BVM kit. The competition was very close, as Terry won by only 1.34 points over second-place winner Mike Barbee.

SPONSORS

PLATINUM
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Pacer Technologies

SILVER
Barbee Concrete & Construction
Bob Smith Industries
Futaba
Proctor
Sun Valley Fliers
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Bob Holman Plans
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Lockheed Martin Fairchild Systems
Mansfield Electric Fliers
Nick Ziroli Plans
One Eighth Air Force
RC Excellence
RC Hobby Center
Scale Specialties
SKS Video
USSMA Webmaster

AIRCRAFT TYPE

EXPERT ENTRIES

- WW II (24)
- Civilian (17)
- WW I (12)
- Jets (5)
- Golden Age (4)
- Post-WW II (4)

TEAM SCALE ENTRIES

- WW II (5)
- Civilian (2)
- WW I (1)
- Post-WW II (1)
- Golden Age (1)

This de Havilland Tiger Moth with its highly unusual paint scheme is the work of Jeremy Fursmån. The seventh-place winner in Expert also was awarded Best Markings and Most Realistic Flight.

Second-place Expert winner Mike Barbee with his 3W-120 twin-cylinder-powered YMF-5 WACO. His 1/3-scale biplane was built from a Peter Barth kit imported by Proctor Enterprises.

PHOTOS BY JERRY NELSON

More than 400 scale modelers competed in 23 qualifiers nationwide held throughout the year, and the top 30 percent of each qualifier advanced to compete in Dayton. This year, a record total of 76 competitors made official flights.

The U.S. Scale Masters Association is run by many volunteers and is chaired by Earl Aune, who is assisted by his wife, Josie. Assisted by Mike Barbee, contest director Bill DeVerna made sure everything happened smoothly. The local RC club—the Westerville R/C Flyers—provided manpower for crowd control, food concessions and all the other behind-the-scenes duties required for a successful national event. Seventy-six contestants flying five rounds in only two and a half days kept everyone hopping. AMA president Dave Brown and his wife, Sally, ran the flight-

Nick Ziroli Jr. flew his Grumman Avenger masterfully and earned a very respectable fifth place in Expert. The big RAF Navy torpedo/bomber dropped a scale torpedo that it held inside its fuselage.

SPECIAL AWARDS

CLASS	MODELER	MODEL	SPONSOR
HIGH STATIC			
Expert	Mike Barbee	WACO YMF-5	Westerville Model Club
Team Scale	Graeme Mears	Tiger Moth	Robart Mfg.
BEST OF			
Golden Age	Manny Sousa	Culver Cadet	Michael Sanderson
Civilian	Corvin Miller	Globe Swift	RC Hobby Center
Military	Al Kretz	Dornier Do 236	Bob Smith Industries
Jet	Scott Foster	F-18 Hornet	Crow Aviation
Markings	Jeremy Fursman	Tiger Moth	Mansfield Electric Fliers
Documentation	Dan Pierson	Bonanza VB35	Scale Model Research
WW I	Gary Parker	Fokker D-VII	Proctor Enterprises
WW II	Jeff Foley	Bf-109	Aerotech Models
Built-up Kit	Mike DeBlasis	Triplane	Nick Ziroli Plans
Scratch-built	Dan Pierson	Bonanza VB35	Vailly Aviation
Engineering	George Marriano	TU-4	Robart Mfg.
Pilot's Choice	George Marriano	TU-4	Bob Holman Plans
FLIGHT AWARDS			
High Flight Score	Terry Nitsch	Rafale	Sun Valley Fliers
BEST MISSION			
Expert	Greg Hahn	Dauntless	Airtronics
Team	Tim Schurick	Bronco	Airtronics
MOST REALISTIC FLIGHT			
Expert	Jeremy Fursman	Tiger Moth	Airtronics
Team	George Marriano	TU-4	Airtronics

HARRIS LEE LIFETIME ACHIEVEMENT

Bruce Bender

Corvin Miller's impressive Globe Swift is detailed inside and out. Here, the open door reveals a beautifully appointed cockpit interior. Corvin placed 19th in Expert.

This close-up of fourth-place winner Jeff Foley's Me-109 shows his fine craftsmanship and building skills. Jeff flew the Luftwaffe fighter very smoothly and won Best WW II Aircraft.

Bob Patton's 28-percent-scale T-34C comes in for a landing. Bob placed ninth in Expert with his 111-inch Beechcraft.

line so efficiently that all competitors were able to fly five full rounds. Four flight stations were in use at all times. Dave and Sally acted as air traffic controllers, communicating by radio to monitor the air traffic.

The two classes are Team and Expert. Team allows a builder to have someone perhaps more skilled fly his aircraft. In Expert, the builder is also the pilot. Ten team entries and 76 expert contestants participated this year. Individual championship awards are given for both classes, along with many "best of."

JUDGING

For modelers who have not attended or competed in scale competition, here is a brief overview of the event rules. The actual competition (Team and Expert) is composed of two parts—static judging and flight performance. A perfect score is 200 points (100 for each part). The static judging is done prior to flying, and one day is set aside just for this. Of the 100 static points, 40 points are for accuracy of the model's outline, 30 for color and markings and 30 for the builder's craftsmanship. The contestants must provide 3-views as well as photos and color documentation of their subjects.

To earn flight points, the contestant flies nine maneuvers in each round; each can earn from one to 10 points. There are extensive flight maneuvers to choose from. Typically, the modeler chooses what the full-scale aircraft did: bombers drop bombs, fighters perform combat maneuvers, aerobatic models do advanced aerobatics, and Cubs do what only Cubs can do. An additional 10 points are earned for flight realism. Part of the realism score is scale speed, which is somewhat difficult to determine by both the pilot and the judges. The scores of the best three flights are then averaged for a maximum possible flight score of 100 points.

The flight judges have a difficult job. They must be trained on the various flying characteristics of all the full-scale versions of the model aircraft that are competing. Since the judges cannot be expected to have first-hand knowledge of how all the full-scale aircraft actually performed, they can only base their final scores on what the contestants tell them about the full-scale aircraft.

After the static judging, the museum was closed to the public for the evening, and a special dinner for modelers was served inside the museum's display aircraft area. This was also a great opportunity for everyone to inspect their favorite aircraft; they were even able to sit in the cockpits of some of the aircraft. Scale Masters chairman Earl Aune sat inside the SR97 Black Bird. Could this be a future scale project for Earl?

NOONTIME SHOW

The Westerville R/C club organized an airshow each day at noon. Various types of

Sixth-place Expert went to Gary Parker with his Proctor Fokker D-VII. Powered by a Laser 300 V-twin, the WW I fighter earned a 97 static score. Gary also won Best WW I award.

TECH TALK

RADIOS	
Futaba	32
Airtronics	21
JR	20

ENGINES	
O.S.	19
Zenoah	7
Laser	6
Precision Eagle	4
Quadra	3
SuperTigre	3
Webra	3
Moki	3
3W	2
Brison	2
Byron Originals	1
Cheetah	1
Enya	1
Kavan	1
Robart	1
Sachs	1
Saito	1
YS	1

TURBINES	
AMT	2
RAM	1
Sophia 850	1

ELECTRIC MOTORS	
AstroFlight	2
MaxCim	1

FUEL	
Gasoline	27
Cool Power	8
BVM	5
Byrons	5
Omega	5
Wildcat	4
Sig	3
Red Max	3
Homemade	3
PowerMaster	2
K&B	1
Morgan	1

AIRCRAFT TYPE	
Kit-built	24
Plan-built	22
Scratch-built (own plan)	17

models flew, and the crowd really loved Bob Noll's superb aerobatic demonstration with his 40-percent CAP; it was outstanding!

A U.S. Scale Masters' tradition is to allow time for an up-close public viewing of the models before the judges' break and the noontime airshow. All the models are lined up down the middle of the runway, and the pilots stand next to their aircraft to answer questions. Spectators can take photos up close—an excellent public relations demonstration. The more people from behind the fence that we can involve in our hobby, the more our hobby will grow.

What does it take to win the Scale Masters (other than skill and practice)? I'd have to say a giant-scale aircraft. Not necessarily of a particular size, but an aircraft that weighs more than 30 pounds. Average weight of the top 10 aircraft was more than 33 pounds. Over the years, the quality of flying has improved, and to place in the top 10, you need a flight score of more than 90 points. The larger and heavier aircraft give you better, more precise flight performance, especially when the flying is done in less-than-perfect wind conditions.

Above: this Russian TU-4 (B-29 copy), built by George Marriano, comes in for a landing. Flown in Team Scale by Dave Pinegar, the third-place-winning TU-4 earned the Engineering Achievement and Best Scratch-Built. Left: seventeenth-place winner in Expert, John Chevalier, flew this 1/3-scale Piper Tri-Pacer. Built from W.E. Tech plans, the model is powered by a Zenoah G-62 and has a 117-inch span. Below: Roy Vaillancourt flew this beautiful 1/5-scale Hawker Typhoon to 13th place in Expert. Powered by a Quadra Q-75, the all-wood model earned 94.5 static points.

SPONSOR SUPPORT

The Scale Masters is a volunteer organization, and sponsor support is extremely important to the success of this event. The 2000 competition was highly successful, and a sincere thank you goes to each and every one.

The 2001 Championship will be held at Lenhardt's Airpark in Hubbard, OR, in mid-September. Try to arrange your schedule to experience this fantastic modeling event. If you are interested in supporting, joining, or competing in the U.S. Scale Masters, contact the organization at 21952 Airport Rd., Aurora, OR 97002, or call (503) 678-6036 jenseninc@msn.com.

WINNERS

EXPERT

PLACE	PILOT	AIRCRAFT	STATIC SCORE	TOTAL
1	Terry Nitsch	Rafale B10	97	193.50
2	Mike Barbee	WACO YMF-5	98	192.16
3	Greg Hahn	SBD-5 Dauntless	97	190.66
4	Jeff Foley	Messerschmitt Bf-109	97	189.42
5	Nick Ziroli Jr.	Grumman Avenger	97	189.08
6	Gary Parker	Fokker D-VII	97	188.33
7	Jeremy Fursman	DH-82A Tiger Moth	95.50	187.91
8	Shailesh Patel	F-86 Sabre Jet	94.50	187.75
9	Bob Patton	Beechcraft T34C	95	187.41
10	Kent Walters	SBD-3 Dauntless	95	185.83

TEAM SCALE

PLACE	PILOT/BUILDER	AIRCRAFT	STATIC SCORE	TOTAL
1	Patrick/Mears	DH-82 Tiger Moth	98	192.00
2	Hahn/Schurick	OV-10 Bronco	96	191.50
3	Pinegar/Marriano	TU-4 Russian B-29	96	190.41
4	Crooks/Cassidy	P-47 Thunderbolt	94	186.25
5	Sandquist/Siewert	P-47 Thunderbolt	93.50	183.33

***Bob Violett Models (BVM)**, 170 State Rd. 419, Winter Springs, FL 32708; (407) 327-6333; fax (407) 327-5020; www.bvmjets.com.*

***Moki**; distributed by Gerard Enterprises Inc.; 13435 Roswell Dr., Brookfield, WI 53005; (414) 784-4510.*

***O.S.**; distributed by Great Planes; P.O. 9021, Champaign, IL 61826-9021; (800) 682-8948; fax (217) 398-0008; www.osengines.com.*

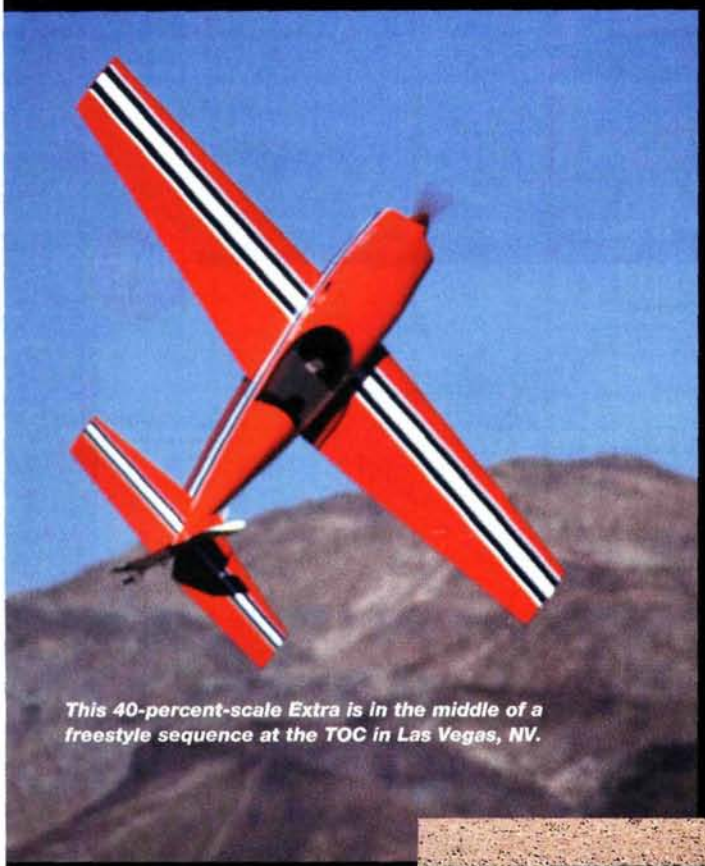
***Proctor Enterprises**, 25450 N.E. Eilers Rd., Aurora, OR 97002; (503) 678-1300; fax (503) 678-1342.*

***Quadra-Aerrow Inc.**, P.O. Box 183, 2040 Rogers Rd. Perth, Ontario, Canada K7H 3E3; (613) 264-0010; fax (613) 264-8441.*

***Robart Mfg.**, P.O. Box 1247, 625 N. 12th St., St. Charles, IL 60174; (630) 584-7616; fax (630) 584-3712; www.robart.com.*

***Zenoah**, 4105 Fieldstone Rd., Champaign, IL 61822; (217) 355-9511; www.horizonhobby.com.* ✦

IMAC AEROBATICS



This 40-percent-scale Extra is in the middle of a freestyle sequence at the TOC in Las Vegas, NV.

The International Miniature Aerobatic Club (IMAC) has been around for more than 25 years, and its popularity has unquestionably grown. Look in any RC model airplane publication, and you'll find more than just a few colorful IMAC airplanes to choose from. Aerobatic competition is challenging for the pilot and entertaining to spectators. Now more than ever, the opportunity to become involved in IMAC aerobatics is wide open to anyone who wants to improve his piloting skills. If you're looking for a new challenge or want to feel a renewed sense of accomplishment that's as great as or greater than the one you felt when you first soloed your RC trainer, then consider this wonderful and rewarding aeromodeling pastime.

The introduction of almost-ready-to-fly (ARF) and almost-ready-to-cover (ARC) aircraft has redefined our hobby. Instead of spending weeks and months building and finishing a model, we can now enjoy bench time that has been reduced by prebuilt aircraft kits to days—even hours. ARFs and ARCs are not likely to totally replace kit-built models, nor should they, but for someone who has little time to build, they are a great way to get to the most exciting part of the hobby: flying!

We've collected as much information as we could on the plethora of prebuilt IMAC-legal airplanes on the market today. Though not a complete list—new products are being introduced almost daily—we're sure this guide will be a helpful source for finding the best IMAC aerobatic airplane for you. If you want to join all the fun and excitement IMAC has to offer, this guide will put you on a straight and level line as you enter the "aerobatic box"!

What is IMAC?

IMAC's objective is to duplicate full-scale sport aerobatics using miniature RC aircraft in a realistic manner that is both challenging for the contestants and intriguing for spectators. All AMA regulations apply to RC fliers. The type of equipment fitted to the aircraft is not limited, nor is the number of controls. IMAC competition is open to all aerobatic monoplanes and biplanes that are replicas of full-size aerobatic competition aircraft. To maintain separate levels of difficulty, there are three classes: Sportsman, Advanced and Unlimited. The aircraft are flown within an imaginary aerobatic space known as "the Box." The maneuver sequences (groups of maneuvers to be flown) are the same as those used in full-scale International Aerobatic Competition (IAC). The sequences are grouped into two categories—Known and Unknown.

The Known compulsory sequences are similar to IAC sequences but are modified to better coincide with model aircraft capabilities and pilot skill levels. The sequences change annually and are printed in the IMAC competition newsletter each spring, along with any updated rule changes.

The Unknown sequences consist of 12 to 15 maneuvers designed for contestants to fly without prior practice. They are assigned on the day of the contest (or the night before) to allow pilots to visualize them. The contestants' flight order is established by a random drawing.

Flight Pattern

A contestant must fly the entire flight according to the established flight schedule for his class and in the sequence listed. Maneuvers that are performed out of order are not scored. Takeoffs and landings are not judged, and it is not necessary for the judges to see the aircraft take off or land. No flybys are allowed during an aerobatic sequence. If a flyby breaks the sequence order, any omitted maneuver and the next maneuver in the sequence earn zero points as a penalty. Whenever the entire airplane is observed flying past any of the box's boundaries or markers, this is noted and the pilot's score is penalized.

3-Minute Freestyle

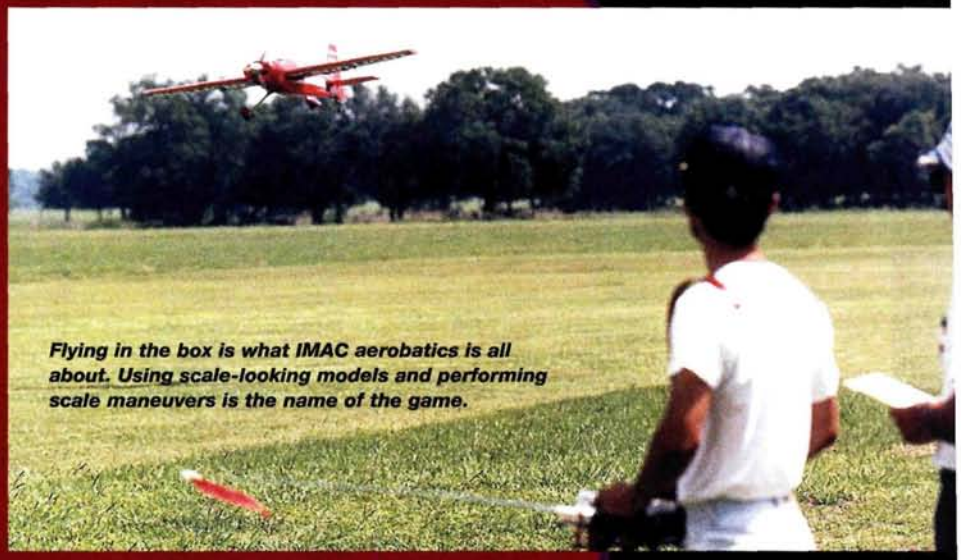
The 3-minute Freestyle is known as "Show Time" and is a separate event. It is an unrestricted, individually created sequence in which anything safe goes! It is scored on:

- **Originality.** Creating new figures, novel combinations of old figures, novel use of the aircraft, an element of surprise and good use of the full aerobatic zone.
- **Versatility.** Displaying a wide variety of maneuvers.
- **Harmony and rhythm.** Choreographic characteristics of sequence.
- **Execution.** The quality of flying and the pilot's ability to hold the judges' and spectators' attention.

Four judges evaluate contestants on each of the criteria separately and rate them on a scale of 0.1 to 10 for a maximum total of 40 possible points.

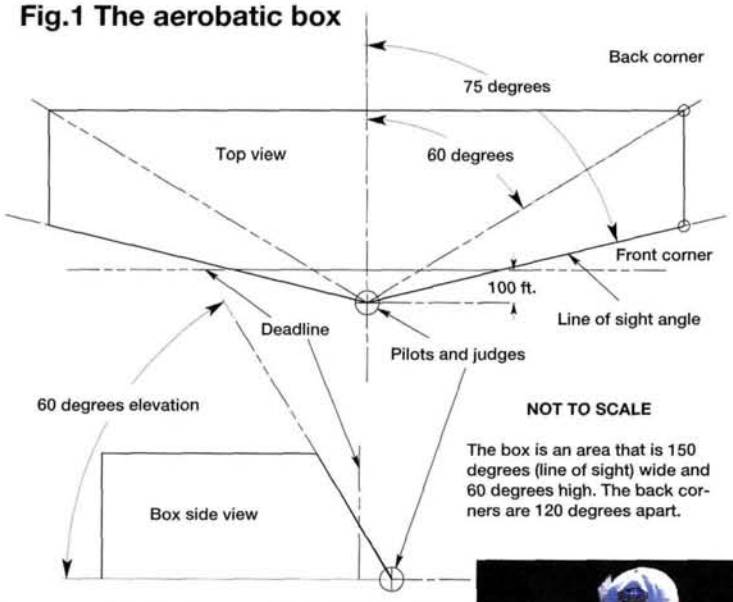
The Aerobatic Box

All maneuvers must be flown in front of the judges in an area that is 60 degrees on either side of the centerline, to the rear corners of the box, 75 degrees to the front corners and no higher than 60 degrees. The minimum altitude is no less than 20 feet. The aircraft must rock its wings before entering the box and again just after leaving it to show the judges the beginning and the end of the sequence. The pilots may also announce the beginning and ending of sequences to alert the judges. There is no time limit while in the aerobatic box, but there is a time limit for starting the engine, taking off and entering the box. All classes' maneuvers are scored on a scale of 10 to 0. Points are deducted for imperfections in positioning, heading, track and attitude. Half (.5) points are also used in judging. Excessive or unrealistic speed and high G-force maneuvers are downgraded. The degree-of-difficulty factor (K-factor) values are assigned to individual maneuvers based on the current FAI catalog of maneuvers and are modified as needed by IMAC. The contestant's score for each maneuver is multiplied by that maneuver's K-factor. The flight score is the sum of all the "K-factored" scores.



Flying in the box is what IMAC aerobatics is all about. Using scale-looking models and performing scale maneuvers is the name of the game.

Fig.1 The aerobatic box



It's all about looking scale; to be legal for IMAC competition, your model has to have a scale pilot figure in its cockpit and an instrument panel.

Safety first! When you're starting an engine, always have a helper securely hold your model before you turn the prop. Pit safety is extremely important at any competition.

IMAC Aircraft SPECIFICATIONS

There are two categories of IMAC aircraft: Formula I limits engine size to .50ci for 2-stroke and .65ci for 4-stroke engines. Formula II uses engines larger than Formula I, but they cannot exceed AMA limits.

- **Formula I and Formula II** may be combined or flown separately in two categories at the discretion of the contest director.
- **Only single-engine** aircraft are allowed (electric motors or engines are permitted).
- **An effective muffler** must be used.
- **Ready to fly,** the model cannot weigh more than 55 pounds.
- **There is no minimum** size or weight restriction.
- **The builder-of-the-model** (BOM) rule does not apply. Several contestants may, if they wish, compete with the same airplane, as is frequently done at full-size aerobatic competitions.
- **Workmanship and materials** quality must be of acceptable standards. The contest committee can refuse permission to fly or may disqualify any aircraft that is not up to reasonably safe standards in material, workmanship, radio installation, or condition as a result of a crash.

PROOF OF SCALE

To prove that the model resembles a full-size aircraft, some sort of scale documentation is required and is the responsibility of the contestant. The general outline of the model must approximate the shape of the subject aircraft and will be judged from a distance of 10 feet. Exact scale is not required or intended. If no proof of scale is provided but the CD can determine that the aircraft is a replica of a full-size aircraft, then the contestant may be allowed to compete. Scale variation from wingspan should not exceed 10 percent; fuselage width and height may be reduced up to 20 percent.

IMAC ARF/ARC LISTING

Manufacturer	Type	Name	Span	Weight	Engine size	Price
Aeroworks	ARC	Giles 202	106 in.	24 to 26 lb.	5 to 7ci	$1,750
	ARC	Sukhoi Su-31	101 in.	23 lb.	3.7 to 6ci	$1,750
	ARC	Extra 300L	116 in.	32 to 36 lb.	6 to 7ci	$2,350
	ARC	Extra 300L	98 in.	20 to 22 lb.	4.2 to 6ci	$1,750
	ARC	Edge 540 (40%)	117 in.	34 to 36 lb.	140 to 160cc	$2,295
	ARC	Edge 540 (36%)	105 in.	22 to 25 lb.	4.2 to 6ci	$1,725
	ARC	Edge 540 (29%)	84 in.	13 to 14 lb.	1.8 to 3.2ci	$1,095
	ARC	Edge 540 (25%)	73 in.	9 to 10 lb.	.90 to 1.50ci	$995
	ARC	Edge 540T	117 in.	34 to 36 lb.	140 to 150cc	$2,350
	ARC	Edge 540T	105 in.	23 to 25 lb.	4.2 to 6ci	$1,750
	ARF	Edge 540T	105 in.	23 to 25 lb.		$995
Aircraft Intl. Inc.	ARC	Giles 202	114 in.	34 to 38 lb.	3W-120 to 3W-140	$1,950
	ARC	Extra 330S	118 in.	35 to 38 lb.	3W-140 to 3W-155	$2,095
	ARC	Ultimate	93 in.	42 to 45 lb.	3W-140 to 3W-156	$1,490
Airwildhobbies.com	ARC	Edge 540T	81 in.	13 to 14 lb.	1.8 to 2.7ci (glow/gas)	$550
Cactus Aviation	ARC	Z-250 Wigens	99 in.	23 lb.	3.7 to 4.2ci	$995
	ARC	Super Chipmunk	102 in.	22 lb.	3.7 to 4.2ci	$995
	ARC	CAP 232	126 in.	37 lb.	3W140iB2 to 3W150iB2	$1,895
	ARC	Giles 202	114 in.	35 lb.	120 or 140cc	$1,950
	ARC	Extra 330	118 in.	35 lb.	3W120 to 3W150B2	$2,095
	ARC	Ultimate 10-300	92 in.	44 lb.	3W150B2	$1,545
Cermark	ARF	Pitts S2B	60.5 in.	9.5 to 10.5 lb.	.90 to 1.20ci	$399.95
	ARF	Ultimate	60.5 in.	9.5 to 10.5 lb.	.90 to 1.20ci	$399.95
Dave Patrick Models	ARC/ARF	Ultimate	60.5 in.	9.5 to 10 lb.	.90 to 1.20ci, 2- or 4-stroke	ARC: $349.99/ARF: $399.9
	ARF/ARC	Extra 330L	76 in.	11 to 12 lb.	1.2 to 1.4ci	ARF: $429 ARC: $379
Desert Aircraft	ARF	Christen Eagle	92 in.	33 to 38 lb.	120 to 150cc	$3,600
	ARF	Pitts S1 Special	95.6 in.	33 to 38 lb.	120 to 150cc	$3,995
Eurokitplane.com	ARC	Wigens Z 250	91 in.	17 lb.	2.44 to 4.88ci	$461.53
	ARC	Extra 260	84 in.	15 to 17 lb.	1.8 to 3ci	$384.61
	ARC	Extra 260	94 in.	18 to 22 lb.	2.44 to 4.88ci	$461.53
	ARC	Yak 18 PM	94 in.	17 to 20 lb.	1.8 to 3ci	$349.64
	ARC	Diabolo	91 in.	17 to 20 lb.	2.44 to 4.88ci	$461.53
Giantscaleplanes.com	ARC	GS300 Staudacher	90 in.	22 lb.	3.7 to 4.2ci	$499.99
	ARC	Giles 202	96 in.	25 lb.	4.2 to 5.8ci	$674.99
	ARC	CAP 232	96 in.	25 lb.	4.2 to 5.8ci	$674.99
	ARC	Christen Eagle	69 in.	15 lb.	G-45	$874.99
	ARC	Giles 202	109 in.	35 lb.	120 to 150cc	$899.99
	ARC/ARF	Edge 540	103 in.	25 to 27 lb.	100 to 120cc	ARC: $674.99/ARF: $874.
	ARF	Edge 540	80 in.	13 to 15 lb.	2.7 to 3.2ci	$499.99
	ARF	CAP 232	80 in.	13 to 15 lb.	2.7 to 3.2ci	$499.99
	ARF	Extra 300	80 in.	13 to 15 lb.	2.7 to 3.2ci	$499.99
Great Planes	ARF	Giles 202	73 in.	12.5 lb.	1.2 to 2ci	$349.99
Hangar 9	ARF	CAP 232	73 in.	11 lb.	1.08 to 1.35ci (2-stroke)/1.20 to 1.80ci (4-stroke)	$329.99
	ARF	Edge 540	78 in.	11.7 lb.	1.08 to 1.48ci (2-stroke)/1.20 to 1.80ci (4-stroke)	$359
	ARF	Extra 330L	97 in.	24.8 lb.	60 to 70cc (3.8ci)	$799
Lanier	ARF	CAP 232	80 in.	12 to 17 lb.	1.5 to 3.2ci (2-stroke)/1.6 to 3ci (4-stroke)	$899.95
	ARF	Extra 300L 1.20	77.25 in.	10 to 12 lb.	.90 to 1.20ci (2-stroke)/1.20 to 1.22ci (4-stroke)	$595.95
Model Aircraft Composites	ARC	CAP 232	118 in.	38 lb.	150 to 170cc	$1,800
Proplane.com	ARF	Extra 300S	87 in.	12 to 14 lb.	1.8ci to G-45	$895
RadioCraft	ARC	Staudacher S-3000	103.5 in.	25 lb.	4.2 to 6ci	$849
	ARC	33% Extra 330LX	104 in.	24 to 26 lb.	4.2 to 6ci	$1,095
Sig Mfg.	ARF	CAP 231	73 in.	10.5 to 11 lb.	1.2 to 1.5ci (2-stroke)/1.4 to 1.8ci (4-stroke)	$499.95
	ARF	Extra 300XS	73.625 in.	12 to 13 lb.	1.2 to 1.5ci (2-stroke)/1.4 to 1.8ci. (4-stroke)	$519.95
	ARF	Sukhoi Su-31	76.75 in.	13 to 14 lb.	1.5 to 2.1ci (2-stroke) 1.8 to 2.7ci (4-stroke)	$599.95
The World Models	ARF	CAP 232	73 in.	10.5 lb.	.91ci (2-stroke)/1.2ci (4-stroke)	$399.99
Winner R/C	ARF	Pitts 120	60 in.	10.5 lb.	4C 1.2 to 1.5ci	$389.99
	ARF	Ultimate 120	60.5 in.	10 lb.	4C 1.2 to 1.5ci	$389.99
Yellow Aircraft	ARF	CAP 232	72.5 in.	11 to 12 lb.	1.09 to 1.5ci (2-stroke)/1.2 to 1.8ci (4-stroke)	$436
	ARF	Extra 300L	72.5 in.	11 to 12 lb..	1.09 to 1.5ci (2-stroke)/1.2 to 1.8ci (4-stroke)	$436
	ARF	Sukhoi Su-31	72.5 in.	11 to 12 lb.	1.09 to 1.5ci (2-stroke)/1.2 to 1.8ci (4-stroke)	$436

Comments

Each features a presheeted wing and tail; jig-built fuselage; foam turtle deck and hatch cover; epoxy/glass cowl and pants. Two-servo wing option on all Edge models; 3-servo option on 116-inch-span Extra 300L. All planes except ¼- to ⅓-scale Edges and Sukhois include an aluminum tail tube and have a removable stab. Each model has an aluminum wing tube. Edge 540T has Ultracote covering, painted cowl and pants and built-in, 2-servo wing option.

The Hangar 9 CAP 232 ARF is a very popular model for both sport and competition flying. Powered by a Saito 1.50 4-stroke engine, the airplane has wonderful performance.

The Extra 300 is a very popular aerobatic model. Several kits are on the market in various scale sizes.

Each features a gelcoated, fiberglass fuselage; balsa-sheeted foam wing; installed wing and stab tubes; and control surfaces ready for hinging.

Balsa, lite-ply and foam construction; two-piece, plug-in wing; epoxy/glass cowl and pants.

Each features a gelcoated, fiberglass fuselage; balsa-sheeted foam wing, stabilizer, rudder and elevator; carbon-fiber engine mount; carbon-fiber-reinforced, composite landing gear; cut and sanded servo bays; installed and beveled leading and trailing edges.

The Giantscaleplanes.com GS300 Staudacher is an ARC and has a 90-inch span. This model is powered by a 3W 60cc gas engine and is an excellent performer.

Each features built-up balsa construction; Ultracote covering; pull/pull controls; painted fiberglass cowl and pants; fuel tank and accessories.

Each features all balsa-and-ply construction; heavy-duty engine mount, pull/pull tail linkages; fiberglass cowl and pants; adjustable stab incidence.

Ply and lite-ply construction; Swiss steel flying wires; fuel tank installed; epoxy/glass cowl and pants; adjustable engine mount box.

Fiberglass fuselage, balsa-sheeted foam wing and rudder; comes with cowl, landing gear and accessories.

Biplanes are legal for IMAC competition. This 60.5-inch-span Ultimate Biplane is from Dave Patrick Models and is powered by an Enya 1.20 4-stroke engine; great combination.

Christen Eagle ARF has a fiberglass fuse reinforced with carbon fiber; 80-inch Extra 300, CAP 232 and Edge 540 have built-up balsa fuselages; all others are of ply/lite-ply construction. All have gelcoated fiberglass cowl and pants and aluminum wing tube; 80-inch Extra 300 and CAP 232 have composite landing gear; others have aluminum gear.

Interlocking balsa/ply parts; painted fiberglass wheel pants, cowl and belly pan.

Each is constructed of balsa and ply and features Ultracote covering; Sullivan and Du-Bro hardware; painted fiberglass cowl and pants; T6 aluminum landing gear.

Each has balsa and lite-ply fuselage; CAP has balsa and Extra has foam plug-in wing; each has balsa tail, painted fiberglass cowl and pants; all hardware included.

Fiberglass fuselage, cowl and pants; balsa-sheeted foam wings, stab and rudder; landing gear.

Lightweight composite construction; carbon-fiber/epoxy reinforced fuselage.

Each features lite-ply and balsa construction; prebuilt, plug-in wing panels; one-piece, fiberglass cowl; aluminum landing gear and wing tube; cut out ailerons.

Each features Ultracote covering; painted fiberglass cowl and pants; 16-oz. fuel tank with all fittings; heavy-duty hardware. Servo mounts are close to control surfaces for improved response.

Ply and balsa construction; painted fiberglass cowl and pants, glued hinges; adjustable engine mount.

Each features all-wood construction, balsa built-up wing, pull/pull controls on rudder and elevator, painted and trimmed fiberglass cowl.

Balsa, lite-ply airframe; covered and trimmed with MonoKote; painted fiberglass cowl and pants; hardened-aluminum landing gear.

Though not a prebuilt model, this Carden Aircraft 40-percent Giles shows off its impressive size. That's Dennis Gergits holding the model on its monstrously large nose.

IMAC Engines

The radio may be the brains of your IMAC aircraft, but the engine is its heart. Power and reliability are must-haves, and using that power correctly can make all the difference at the end of the day. Power management is every bit as important as how much horsepower you strap to the firewall. Matching your engine to an airplane of the proper size is the first basic step.

You won't go wrong if you watch other competitors fly and then use the same engine and airframe combinations. You will quickly identify successful engine and airplane combos even if you attend only a few competitions. Why experiment when you can simply do as the winners do?

Engine types and sizes are grouped according to aircraft size.

Category II Aircraft

Engine choices by wing size (inches)

60 (bipe); 68 to 75 (mono)
1.20 to 1.80ci 4-stroke; 1.20 to 2.10ci 2-stroke glow; 1.4 to 2.4ci gasoline

75 to 85 (mono)
3ci 4-stroke; 2.5 to 3ci 2-stroke glow; 2.5 to 3.2ci gas

90 to 100 (mono)
3.7 to 5.2ci single cylinder; 75 to 85cc twin-cylinder gas

40-percent scale (mono) 100 to 150cc multi-cylinder engine

The Zenoah GT-80 is a big, twin-cylinder gasoline engine with gobs of power. The 80cc engine has a single carburetor, an intake manifold and a spring starter.

The Enya 1.20R is an all-around popular 4-stroke engine with excellent reliability and power. Once properly broken in, the engine has an exceptional service life.

The new O.S. 1.60 2-stroke glow engine is a real powerhouse. If 2-strokes are your preference, you'll love this one!

The Zenoah G-45 is a 2.7ci gasoline engine that's ideal for 80-inch-span monoplanes. Its magneto-style ignition system is practically trouble-free.

MANUFACTURERS

Aeroworks, 27 S. Nome, Aurora, CO 80012; (303) 367-9792.
Aircraft Intl. Inc., 8 Country Meadow Dr., Colts Neck, NJ 07722; (732) 761-0997; fax (732) 761-8585; www.aircraft-intl.com.
AirWild Hobbies, 17177 Gillette Ave., Bldg. A, Irvine, CA 92614; (949) 833-8988; fax (949) 567-0966; www.airwildhobbies.com.
Cactus Aviation, 10380 E. Heritage, Tucson, AZ 85730; phone/fax (520) 721-0087; www.cactusaviation.com.
Carden Aircraft, 1404-D Spartanburg Hwy., Hendersonville, NC 28792; (828) 697-7177.
Cermark Electronics, 107 Edward Ave., Fullerton, CA 92833; (714) 680-5888; fax (714) 680-5880.
Dave Patrick Models, 1811 E. 400 North Rd., Milford, IL 60953; (815) 457-3128; www.modelmagic.com.
Desert Aircraft, P.O. Box 18038, Tucson, AZ 85731; (520) 722-0607; fax (520) 722-0607.
Enya; distributed by **Altech Marketing**, P.O. Box 7182, Edison, NJ 08818-7182.
Eurokit Plane, 4645 Cornwall St., Hubert, Quebec, Canada J3Y-2S7; (514) 363-4546; fax (514) 363-5363; www.eurokitplane.com.
Giantscaleplanes.com, 201 S. 3rd St. & Rt. 309 N., Coopersburg, PA 18036; (610) 282-4811; fax (610) 282-4816.
Great Planes Model Distributors Co., P.O. Box 9021, Champaign, IL 618 9021; (800) 682-8948; fax (217) 398-0008; www.greatplanes.com.
Hangar 9; distributed by **Horizon Hobby Inc.**, 4105 Fieldstone Rd., Champaign, IL 61822; (217) 355-9511; www.horizonhobby.com.
Lanier RC, P.O. Box 458, Oakwood, GA 30566; (770) 532-6401; fax (770) 532-2163.
Model Aircraft Composites, 921 Monroe St., Paducah, KY 42001; (877) 575-3059; fax (270) 575-9804.
Proplane, 1600 Water St., D-6, Laredo, TX 78040; phone/fax (956) 722-2845; www.proplane.com.
RadioCraft Industries Inc., 1843 E. Leland Cir., Mesa, AZ 85203; (480) 251-1094; trailblz@aol.com.
Sig Mfg. Co. Inc., P.O. Box 520, Montezuma, IA 50171; (800) 247-5008; (515) 623-5154; fax (515) 623-3922; www.sigmfg.com.
The World Models Mfg., Kowloon Bay Industrial Centre, Flat 2, 10/F, 15 Wang Hoi Rd., Kowloon Bay, Hong Kong; (852) 2707-9783; fax (852) 2798-0728; www.theworldmodels.com.
Winner R/C Hobbies, 15437 Proctor Ave., Hacienda Hts., CA 91745; (626) 961-4616; fax (626) 330-9351.
Yellow Aircraft Intl., 203 Mass. Ave., Lexington, MA 02173; (781) 674-9898; fax (781) 674-2288.
Zenoah, 4105 Fieldstone Rd., Champaign, IL 61822; (217) 355-9511; www.horizonhobby.com.

WHERE TO GO

The IMAC organization is divided by geographical location into six regions, each of which holds its own series of events throughout the year. For more information on the IMAC organization, check its website: www.mini-iac.com. Here are the states and provinces by region and whom to contact in your region for more information.

REGION	STATES AND PROVINCES	CONTACT
National	All	IMAC President Thomas Wheeler, IMACpres@mini-iac.com; or secretary/treasurer Dave Arndt, IMACsec@mini-iac.com.
Northeast	CT, DE, MA, MD, ME, NH, NJ, NY, PA, RI, VT, Washington DC and Quebec, Canada	Regional director Alex Bruhn, IMACne@mini-iac.com.
Southeast	AL, FL, GA, KY, NC, SC, TN and VA	Regional director Ben Perreau, (561) 989-7709; IMACse@mini-iac.com.
North Central	IA, IL, IN, MI, MN, OH, WI, WV and Ontario, Canada	Regional director Mark Moldowan, (773) 784-8378 or (773) 275-6070; IMACnc@mini-iac.com.
South Central	AR, KS, LA, MO, MS, OK and TX	Regional director Jason Brown, IMACsc@mini-iac.com.
Northwest	AK, ID, MT, ND, NE, OR, SD, WA and WY	Regional director Daniel Wolanski, (360) 863-1318; IMACnw@mini-iac.com.
Southwest	AZ, CA, CO, HI, NM, NV and UT	Regional director Zdenek (Zee) Stejskal, IMACsw@mini-iac.com.

SPECIFICATIONS

Name: Catalina PBY

Manufacturer: Kyosho

Distributed by: Great Planes Model Distributors

Type: almost-ready-to-fly sport-scale aircraft

Wingspan: 68.5 in.

Wing area: 573 sq. in.

Airfoil: 16-percent semi symmetrical

Weight: 6 lb., 8 oz.

Wing loading: 26.6 oz./sq. ft.

Length: 44.5 in.

Radio req'd: 4-channel w/6 servos

Engines req'd: two .15 2-stroke or .26 4-stroke

Engines used: two O.S. .15 LA

Street price: $379.99

Features: 80-percent complete ARF; dark blue gelcoated, molded, fiber glass-reinforced plastic fuselage, cowls and wingtip floats; balsa-sheeted foam-core wings and built-up tail feathers precovered in film; complete hardware package; removable wingtip floats; landing gear removable for land use.

Comments: quick-building ARF amphibian with a solid construction and a nice scale appearance. Flight performance is very scale and easy to manage. Overall, a very nice-looking and flying aircraft—just what you'd expect from Kyosho.

HITS

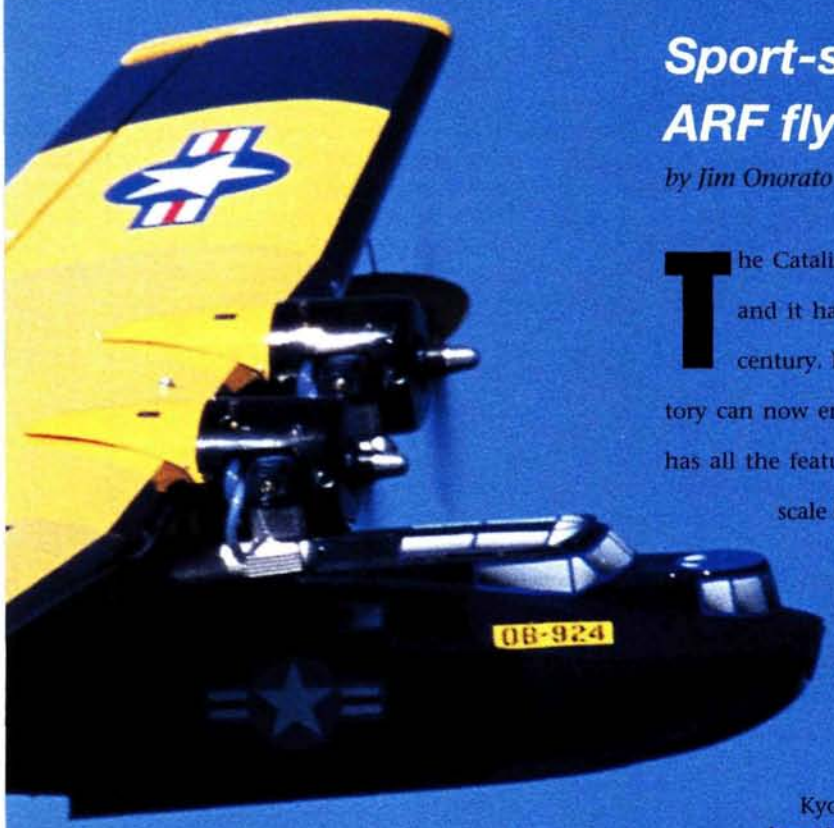
- Realistic, scale-like flight performance.
- Excellent scale appearance.
- High-quality gelcoated fiberglass-reinforced plastic parts.
- All hardware included.

MISSES

- Weak wingtip float mounts ripped out.
- Blue MonoKote on the flying surfaces did not match blue fiberglass fuse.

KYOSHO

CATALINA



PBY

Sport-scale ARF flying boat

by Jim Onorato

The Catalina PBY is the most recognized flying boat ever produced, and it has served with distinction across the globe for over half a century. Model aviators who admire the PBY's unique look and history can now enjoy an excellent RC reproduction from Kyosho. This ARF has all the features we've come to expect from a Kyosho product—great scale looks, high-quality construction and excellent flight performance. For me, the opportunity to review the PBY was a bit of déjà vu, as my first *Model Airplane News* article was a collaborative effort on a 40-size PBY with the late Dick Purdy 10 years ago.

WHAT'S IN THE BOX

Kyosho has some of the best box-art in the industry, and the beautifully printed full-color box the PBY comes in is no exception. But that's only the beginning! The quality of this kit is apparent as soon as you open the box. Inside is a fantastic-looking, fiberglass-reinforced plastic (FRP) fuselage finished in a dark blue gelcoat. There are no seam lines or pinholes; the finish looks perfect. The fin is molded in as an integral part of the fuse. Plywood formers and hard points for the wing struts are already attached, as are the brass tubes for the removable wire landing gear. The wing comes in three sections and is balsa-sheeted foam-core covered with yellow, blue and black MonoKote. Plywood firewalls are already attached to the center section. The wingtips, wingtip floats and three-piece cowls are all made of FRP. The stab is precovered, built-up balsa, and all the movable control surfaces are precovered, solid balsa.

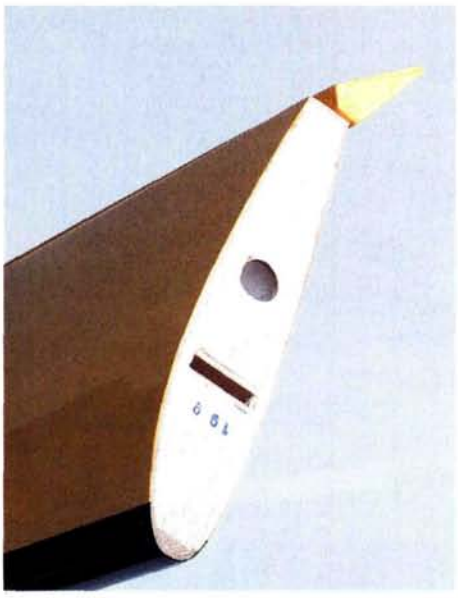
This plane is more than 80 percent complete and includes everything you need to get flying except a radio, engines, propellers and fuel tubing. Two fuel tanks, landing gear, tires, engine mounts, molded blister windows, decals and

a very complete hardware package (with metric nuts and bolts) are all included. A 12-page instruction booklet guides you through assembly without the need for a full-size plan. The instruction booklet is much like the ones Kyosho uses for its RC cars. It includes a lot of symbols and drawings, with very few words. It is written in both Japanese and English, and all dimensions are in millimeters. My kit also included three sheets of supplemental instructions.

ASSEMBLY

As is the case with most ARFs, the covering on my PBY was a bit wrinkled, so I used a sealing iron and a heat gun to smooth things out before I began the assembly. The first steps in assembling the PBY dealt with the wing and engines, and this was, by far, the most time-consuming portion of the project. It isn't particularly difficult, but there is a lot to do. The ailerons are already installed on the outer panels, but the Mylar hinges have to be glued with a few drops of instant glue. I removed the covering from the servo cutouts in the outer wing panels and epoxied the hardwood servo-mounting blocks into place. I used two standard servos for the ailerons, and plastic covers are provided to cover the servos in the cutouts.

Next, I glued on the FRP wingtips and epoxied the fittings for the removable wingtip floats into the dowel hard points. The dowel hard points turned out to be the PBY's only major miss: they tore out during the first takeoff. The problem is that they are glued into the foam-core; they just don't provide enough gluing surface to be strong



The balsa-sheeted foam-core wing comes in three pieces, with pockets for the die-cut plywood wing joiners.

FLIGHT PERFORMANCE

• TAKEOFF AND LANDING

My first attempts at getting the PBY airborne were frustrating. The .15 LA engines did not seem powerful enough to get the plane going sufficiently fast to get on the step. Water splashing over the bow into the props prevented the engines from reaching top rpm. Every time I thought the PBY was about to lift off, one of the floats would catch in the water, and the PBY would spin around and drop off the step. When at last I got it airborne, I noticed that one of the float mounts had been ripped out of the wing, which doubtless contributed to my difficulties.

After modifying the float mounts as discussed in the text, I raised the floats about ½ inch and increased their angle of attack. I also changed the propellers from 8x4 to 7x6 to get more rpm, and I returned to the lake for a second try. Happily, the changes worked. To get a good takeoff, I held the tail until the engines reached peak rpm then let go while holding full up-elevator. As soon as the plane got up on step, I released the up-elevator and let the PBY gain speed as I worked the ailerons to keep the wing level and the floats out of the water. In less than 100 feet, with just a touch of up-elevator, the PBY lifted smoothly out of the water.

Landings were much less stressful. The PBY is very stable in flight and settles in nicely for silky smooth landings.

• SLOW-SPEED PERFORMANCE

The PBY flies smoothly at low throttle, but you have to be careful not to slow down too much or apply too much up-elevator. This plane does not stall straight ahead. In most cases, when I intentionally stalled it, the right wing dropped sharply. It is best to climb to a safe altitude, test the stall speed to learn the PBY's limits, then adjust your flying accordingly.

• HIGH-SPEED PERFORMANCE

Even with two .15 LAs, the PBY flies faster than scale speed. I did most of my flying at part-throttle; I only used full throttle at takeoff to gain altitude quickly or to initiate a maneuver. It flies very smoothly at high speed, but it looks a little out of character zipping around the sky that fast.

• AEROBATICS

The Catalina PBY is not designed for aerobatics, but it is capable of performing basic maneuvers such as rolls and loops. It would probably spin, too, but I didn't try it. Its rolls can be slow at low rate or reasonably fast at high. It does large loops without losing heading and flies inverted with some down-elevator. I did encounter rollout at the top of full-elevator deflection loops at "high" rate but eliminated the problem by reducing elevator throw.

• SINGLE-ENGINE PERFORMANCE

Because the engines on the PBY are set quite close together, it can fly reasonably well on one engine. I experienced the loss of one engine while the plane was too far away for me to tell which one was out, but I had no trouble turning it back toward me for a decent landing. If one engine quits (and one certainly will sooner or later), the best thing to do is to reduce throttle and maintain heading if you can; turning into the dead engine can be dangerous.

Overall, I would say that the Kyosho Catalina PBY flew very well and quite realistically. It is easy to manage, especially given its twin engines and scale appearance. The float mounts needed a little work, but the resulting performance—both in the water and in the air—was quite satisfying.

enough to take the stress on the tip floats during landing or takeoff. To correct this, I cut out a 1¾x5-inch opening in the sheeting on the bottom of the wing and carefully removed the foam. I then inserted a balsa block that was thick enough to contact the upper sheeting and that extended from the leading edge of the wing to the trailing edge. This block contained two dowel hard points for the float mounts, provided ample gluing surface and helped distribute the load imposed by the floats. I did not experience any problems after I made this modification.

I installed the engine mounts and fuel tanks next, followed by the throttle servos. I mounted two FMA mini servos for throttle control in the precut openings and covered them with the provided flat plastic covers. I used die-cut plywood wing joiners that slid into pockets in the wing panels to join the outer panels to the center section. I aligned the panels and glued them together with 30-minute epoxy, making sure the dihedral was the same on each outer panel.

The control surfaces come with Mylar hinges installed. A few drops of instant glue, and they're ready to go.

I installed two side-mounted O.S. 15 LA engines and attached the three-piece cowls with small sheet-metal screws. This required a fair amount of trimming and fitting to get right. After preparing the four wing struts using the special hardware in the kit, I added the attachment fittings to the fuse and wing and temporarily attached the wing to the fuselage. While the wing was attached, I epoxied the stab to the fuse, then added the elevators, rudder and water rudder. Since the blue MonoKote on the rudder did not match the gelcoated fin, I removed the covering from the rudder and replaced it with red and white stripes. The blue on the wing and stab didn't match, either, but I left those alone.

The PBY comes 80 percent complete. The fuse is gelcoated, fiberglass-reinforced plastic, and the kit contains all needed hardware plus some that is optional.

I installed the rudder and elevator servos in the front of the fuselage under the access hatch. I wrapped the receiver and battery in foam and plastic bags and installed them as far forward as I could, but I still had to add a few ounces of lead in the nose to get the PBY to balance at the recommended point. The rudder and elevator linkage rods were made up using the hardware provided, but I had to measure the proper lengths because the instructions were incorrect. Also, since I never use E-Z-type connectors on primary controls, I did not use the ones provided to attach the rudder and elevator rods to the servo arms; I used "L" bends with snapper-keepers instead.

The portion of the fuse under the blister windows was covered with gray vinyl. I trimmed the blister windows with dark blue vinyl on the inside and attached them to the sides of the fuse with small sheet-metal screws. The final step was the application of the decals. The instructions and the box photos clearly illustrate their location.

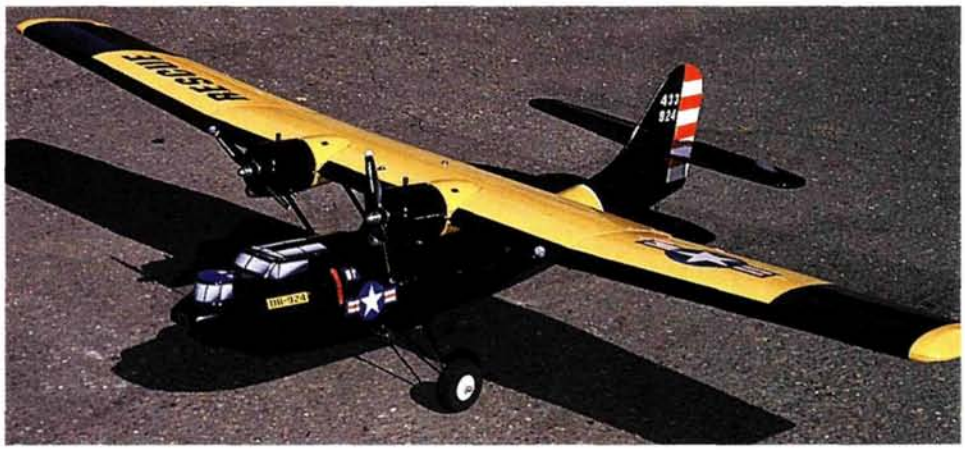
To convert the PBY for land use, remove the tip floats and water rudder and install the landing gear and tailwheel. The landing gear is in two pieces that slide into brass tubes in the side of the fuse and are held on with rubber bands. I did not fly the PBY as a land plane.

CONCLUSION

I found the Catalina PBY to be a well-made ARF that went together easily and had a very realistic scale appearance when completed. That realism carried over into the flight characteristics as well, offering scale performance with no major vices. If you like flying off water as much as I do and want to get into the air quickly with something that looks like a real airplane and flies great, then Kyosho's Catalina PBY is definitely worth a look. I really like this one!

FMA Direct, *9607 Dr. Perry Rd., Unit 109, Ijamsville, MD 21754; (800) 343-2934; fax (301) 831-8987; www.fmadirect.com.*
Kyosho/Great Planes Model Distributors, *P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-1104; www.hobbies.net/kyosho.*
MonoKote; *distributed by* ***Great Planes Model Distributors Co.,*** *(800) 682-8948; fax (217) 398-0008; www.greatplanes.com.*
O.S.; *distributed by* ***Great Planes;*** *www.osengines.com.*

The PBY includes landing gear, in case you want to fly off a field instead of a pond.



KSJ SILKY WIND 400

Classic looks, cutting-edge performance

by Roger Post Sr.

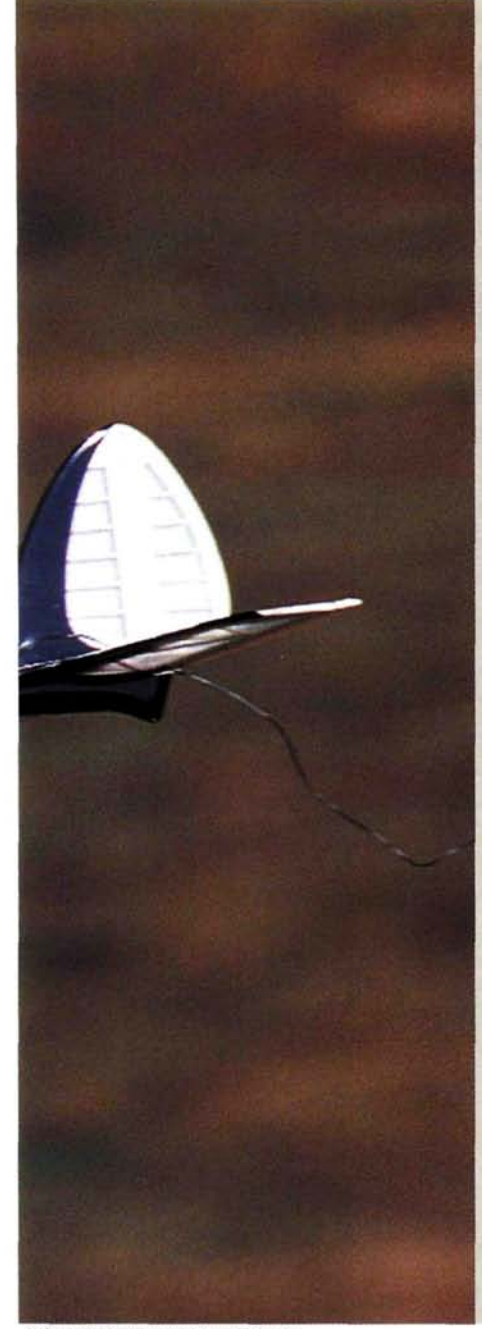
I chose to build KSJ Silky Wind 400 (distributed by Horizon Hobby) because it reminded me of the old free-flight models of days gone by. I always liked the look of those planes and was pleased to see a model that combines the classic style of the old free-flyers with modern micro/mini RC equipment and electric power. I've watched too many unguided free-flighters go up and keep going, never to be seen again! The Silky Wind takes only a few hours to assemble and that made it so much more enticing; I was able to fly it the day after I started assembling it.

The Silky Wind kit is well designed and very complete, which speeds the assembly process considerably. The fuselage is lightweight composite painted glossy black. The wing and tail are covered in translucent film; the machined aluminum spinner and wheel collars are anodized purple to add a touch of color. The Speed 400 motor and high-performance prop are included, as is an illustrated instruction manual.

ASSEMBLY

After I inspected the parts—which were of excellent quality—I looked at the instruction manual. There are only 12 assembly steps, and each has a corresponding illustration. Step 1 involves installing the pushrod guide tubes. It's best not to permanently glue them into place at first because you'll need to line them up with the servo arms after the servos have been installed. (Note that the line in the drawing that extends from the word "former" is drawn to the incorrect position. The forward portion of the two pushrod guide tubes extends 2mm forward of the aft radio-compartment former.)

Next, add the two tail blocks; make sure that the balsa block for the horizontal stabilizer is level with the top of the fuselage sides. Now install the servos—my two



PHOTOS BY GERRY YARRISH & WALTER SIDAS

FLIGHT PERFORMANCE

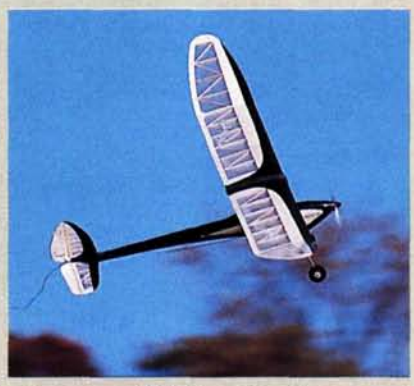
• TAKEOFF AND LANDING

I chose to hand-launch the Silky Wind because my flying field is grass. At full power, the Silky Wind has a stable, low-angle climbout and requires a little bit of right rudder to keep the ground-track straight. Once I reached a safe altitude, I pulled back the throttle to 75 percent and added two clicks of up-trim and a few clicks of right rudder trim. I didn't have a chance to fly it off a paved surface, but I would guess that the model will ROG off pavement in 20 feet—plus or minus a few.

To land the Silky Wind, you'll need to allow plenty of room for the approach. With power off, the model glides rather quickly and descends slowly. If you chop the power in the downwind leg and do not have a strong headwind to turn into, you might have to extend the downwind farther than expected to allow the model to lose some altitude. Once you have it lined up on final, bleed off airspeed by gently pulling on the elevator stick. At the correct speed, the model will gently touch down and have a short rollout. Try to 3-point the model because if it wheel-lands, the friction from the grass could abruptly slow it and flip it over.

• LOW-SPEED PERFORMANCE

To achieve slow flight, lower the power to 30 percent and add enough up-trim to keep the model from descending. If you find a thermal, cut the power and try soaring; the Silky Wind will happily oblige. The controls respond well at slow speeds, and its power-off stall is a gentle forward fall that can be arrested by adding power. At low speeds, the SR battery pack provided a solid 10 minutes of flight time.



• HIGH-SPEED PERFORMANCE

The Silky Wind's appearance is deceptive. Although it is not a speed demon, it can move quickly; they weren't kidding when they called the propeller "high performance." The model's top speed is in the neighborhood of 25 to 30mph, and it responds well at high speeds, turning tightly. I can easily envision these models starting a new class of electric pylon racing. Depending on the model's angle of attack, the power-on stall has a fairly steep forward fall that can be stopped by releasing the up-elevator. The SR battery provided 8 minutes of flight time at high speed.

• AEROBATICS

This model can perform gentle loops and stall turns as well as barrel rolls and spins. It will fly inverted, but this requires a skillful balance of throttle, elevator and rudder. Cuban-8s are possible, but entry speed must be built up in advance.

When the wind is calm, the Silky Wind is fun to fly, and it has a wide speed range to provide exciting flights. Its high speed might be too much for beginners to handle, but with the help of an experienced pilot, the Silky Wind can be fun for pilots of any skill level.

Hitec HS 81MGs fit perfectly in the tray. At this point, I glued the vertical stabilizer to the horizontal stabilizer, but I did not glue the completed assembly to the fuselage because I had more work to do on the fuselage's inside and front. There isn't much space to work with inside the fuse, and I didn't want to damage the tail surfaces by banging them into workshop items while I moved the fuse around to work on it.

Before I installed the supplied motor, I cut out the vent holes in the bottom of the fuselage. Their locations are shown as shaded areas on the drawing. Then I installed the motor, the Castle Creations Pixie 14 ESC and the Hitec Feather receiver, followed by the battery tray for the SR 7-cell 500mAh battery pack. I then assembled the pushrods and attached them to the servo arms per the instructions (pushrod attachment to the control horns will come later). I found it easier to use two 1/16-inch wheel collars rather than the supplied rod joint to connect the two parts that form each pushrod.

The Silky Wind 400 can be built quickly, and the finished product has all the style of a classic free-flight model.

Next, assemble and install the landing gear and wheels. Add the radio hatch cover after locating its magnetic holder. Note that you *do not* install the propeller at this time. Now that the fuse work is done, you can go back and attach the control horns to the rudder and elevator, and then glue the tail surfaces into place (be sure their alignment is accurate). While the epoxy cures, assemble the wing.

When the epoxy was fully cured, I turned on the radio, made sure the servo arms where centered and hooked up the pushrods to the rudder and elevator control horns. To fit the pushrod wires into the control-horn holes, I enlarged the holes slightly with a 0.035-inch drill bit. I made minute adjustments to the pushrod lengths via the splices in the pushrods that are inside the fuselage.

The next step is to set the control throws—13 to 15mm up and down for the elevator and the same amount left and

K&S SILKY WIND 400

SPECIFICATIONS

Model: Silky Wind 400

Manufacturer: KSJ

Distributor: Horizon Hobby Distributors

Type: electric-powered park flyer

Wingspan: 60 in.

Weight: 21 oz.

Airfoil: flat bottom

Overall length: 33¼ in.

Motor req'd: 400-size motor (included)

Battery req'd: 7-cell, 8.4V, 600mAh flat pack

Battery used: SR Batteries 7-cell 500mAh flat pack

Radio req'd: 3-channel w/2 micro- or miniservos and one ESC for a 400-size motor

Radio used: JR 783; Hitec positive-shift 555 receiver

Speed control used: Pixie 14

List price: $299

Features: fiberglass fuselage; prebuilt and covered wing halves and tail surfaces; high-torque 400-size electric motor; high-performance propeller; large sponge wheels; magnetic hatch cover; assorted hardware to complete the model; rubber bands; instruction manual.

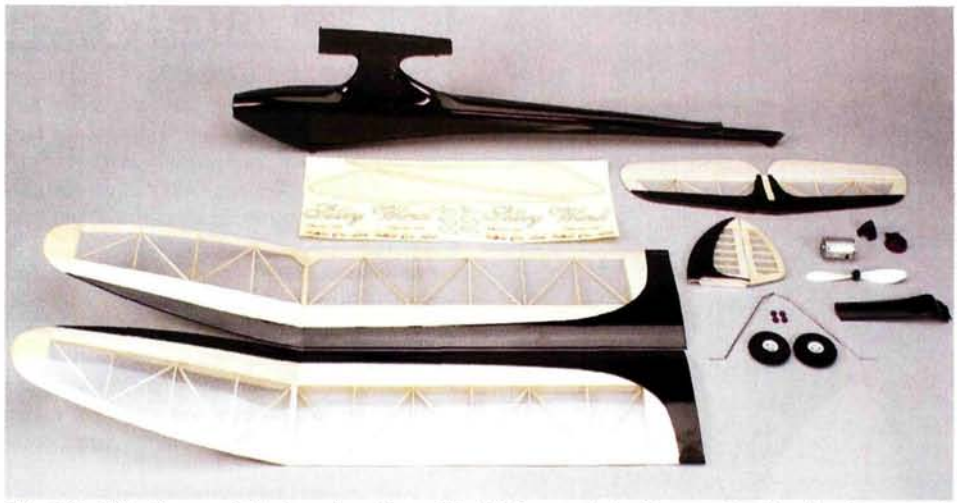
Comments: the Silky Wind 400 can be assembled in a single evening. Its overall quality is quite good, and I was pleased with the finished results; it looks good and flies wonderfully.

Hits

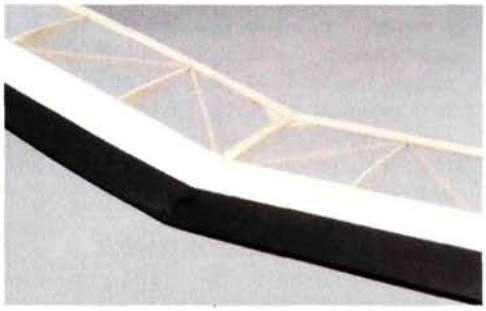
- Good-quality parts.
- Entertaining flight characteristics.
- Lightweight construction.
- Assembles quickly.

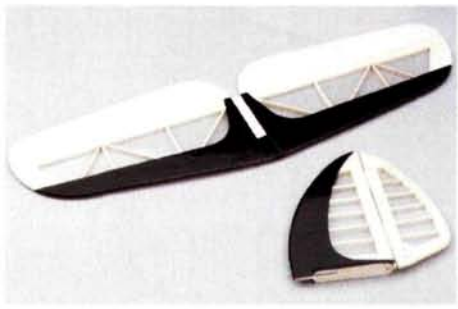
Misses

- Inside fuselage area is a little tight to work in.



The Silky Wind is a well-designed package. The kit is complete, the construction is strong, and covering gives the plane a very polished "retro" look.





Clockwise from above: the large, flat-bottom airfoil with lots of dihedral makes for very stable slow-flight performance. The model is tough to stall and easy to recover. ■ Like the wing, the tail surfaces come hinged and covered in black and translucent film. ■ The Speed 400 motor and prop (both included) give the Silky Wind very spirited performance. At full throttle, it can approach speeds of 30mph. ■ The provided landing gear is simple and strong. The purple-anodized wheel collars add a touch of color to the model. ■ The Hitec HS 81MG servos fit into the tight servo tray with their arms cut down. I used 1/16-inch wheel collars to hold the two pushrod pieces together.

right for the rudder. With the supplied rubber bands, attach the wing to the wing pylon (the instructions call it a "stay"). Check its alignment with the horizontal stabilizer to ensure that it is centered.

PREFLIGHT ADJUSTMENTS

All that remains is to break in the motor, install the propeller and balance the model. To achieve maximum performance, it is recommended that you break the motor in by running it for 15 to 25 minutes at 70-percent power, without the propeller attached. Once you've done this, you can attach the propeller and balance the model with the CG 55mm behind the leading edge. Now your Silky Wind is complete. All that's left to do is to range-check the radio, charge up your batteries and head to the field.

SATISFIED CUSTOMER

The Silky Wind 400 is one of the quickest and easiest to assemble ARFs I've ever encountered; the model is ready to fly in 4 to 5 hours. When it was finished, I felt a wave of nostalgia that brought me back to my days as a teenager, when I watched those old-timer free-flight airplanes fly away. But the Silky Wind *will* return from the wild blue yonder. I recommend it to novice and advanced fliers; a beginner could learn to fly it, but he should seek some experienced help. Pick one up, and take a "radio-controlled" step back in time.

Castle Creations, *18773 W. 117 St., Olathe, KS 66061; (913) 438-6325; fax (913) 438-1394; www.castlerc.com.*
Hitec RCD Inc., *12115 Paine St., Poway, CA 92064; (858) 748-6948; fax (858) 748-1767; www.hitecrcd.com.*
Horizon Hobby Inc., *4105 Fieldstone Rd., Champaign, IL 61822; (217) 355-9511; www.horizonhobby.com.*
SR Batteries Inc., *Box 287, Bellport, NY 11713; (516) 286-0079; fax (516) 286-0901.* ✦

by Gerry Yarrish

The venerable Piper J-3 Cub is one of the all-time classic aircraft designs. During the early part of WW II, Piper converted its basic civilian J-3 into a military observation and liaison aircraft by replacing the top of the cabin with transparent Plexiglas that extends well behind the pilot's seat. So configured, the bright yellow Cub became the olive drab L-4 Grasshopper.

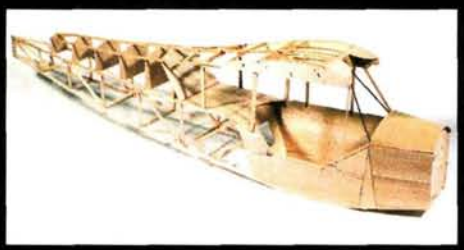
BALSA USA

Piper Cub

The Balsa USA ¼-scale Piper Cub kit is also a classic and has been around for a very long time. Its excellent flight characteristics, relatively accurate scale outline and plug-in wing panels make it a popular choice for first-time giant-scale modelers. Balsa USA recently re-engineered the kit to bring the quality of its die-cut parts up to today's high standards. I built the original kit many years ago, so I thought the new Cub would be a good candidate for kit-bashing the military L-4 version. Built either way, the J-3 is a good starting place for anyone who wants to try an IMAA-legal model or to enter scale competition.

THE KIT

Inside the well-organized box, you'll find a lot of balsa, spruce and plywood. If you have previously assembled only ARFs, you may be surprised by the amount of lumber, but the kit is fairly easy to assemble. All the hardware, the formed music-wire landing gear, the clear window material and the vacuum-formed engine cowl are of good quality. The instruction manual is photo-illustrated and has check-off-as-you-go boxes next to each step, so you can quickly resume where you left off. Items you'll need to complete the kit include radio gear and engine, engine mount, 16-ounce fuel tank, pushrod material, hinges, ¼-scale Cub-style wheels, 1½-inch tailwheel assembly, covering material and paint.



Here, the main fuselage framework has been completed. The simple stick-and-former construction is light and strong.

The manual suggests that you begin construction with the fuselage sides. I, however, like to limber up by building the tail surfaces first. These are made of die-cut balsa and lite-ply outline pieces with balsa sticks used as ribs. The stab and rudder outlines are laminations of two balsa layers (top and bottom) and a lite-ply center. After each part has been assembled and sanded smooth, you glue them together to form the control surface. Though a bit time-consuming, this technique produces strong, warp-resistant parts. I used Du-Bro flat, pinned hinges throughout.

The fuselage is of typical stick construction and has four ¼x⅜-inch main

PHOTOS BY WALTER SIDAS AND GERRY YARRISH

A civilian J-3 becomes a military L-4

SPECIFICATIONS

Model: Piper J-3 Cub/ L-4 Grasshopper

Manufacturer: Balsa USA

Type: 1/4-scale monoplane

Wingspan: 108 in.

Wing area: 1,610 sq. in.

Length: 68 in.

Weight: 15.5 lb.

Wing loading: 22.18 oz./sq. ft.

Power used: O.S. 1.20 4-stroke

Prop used: APC 15x6

Radio req'd.: 4-channel (aileron, rudder, elevator and throttle)

Price: $156.95

Comments: the ¼-scale Piper J-3 Cub is a redesign of a previous kit, and its excellent wood and hardware allow you to build this classic model. It uses conventional stick-and-former construction and laminated parts for a strong, light construction. Items needed to complete the kit include engine mount, fuel tank, pushrods, hinges, wheels and tailwheel assembly.

Hits

- Easy to build using common shop tools.
- Excellent die-cutting.
- Well-drawn plans.

Misses

- A few soft balsa wood sticks have been replaced with firmer stock.

longerons. Begin by building the upper cabin and window frames and then add the ¼-inch-balsa cabin side pieces. Then add the main longerons followed by the uprights and diagonal supports. Again, as you would with any model, be sure to build a left side and a right side.

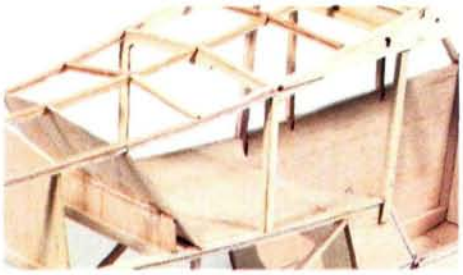
After you have installed the lower landing-gear support doublers on each side, connect the two sides by installing the large plywood landing-gear support plate and the lite-ply cabin formers. Pull the tail ends together, glue them, then assemble and install the upper fuselage formers and the lower cross-pieces. Make sure that the structure is straight and true before you add the cabin top.

This is where I began the L-4 conversion. If you build the stock J-3 Cub, you must sheet the cabin top and add the parts for the small skylight opening. Since the L-4 has a transparent "greenhouse" cabin top, I omitted the sheeting and installed thin spruce strips in its place to act as window support frames. Before you attach the cabin top to the fuselage, add the plywood firewall and the tank-support pieces as well as the forward fuselage sides and the bottom pieces.

A ¼-scale pilot figure (from Officers and Gentlemen) awaits his next sortie.

Install your engine mount before you attach the firewall to the fuselage; this makes it much easier to install the blind

nuts. Temporarily attach the cabin top and support it with scrap balsa sticks. After making sure that the top is correctly positioned, install the forward cabane strut wires, and



The biggest differences between the L-4 and the J-3 versions of the Cub are the side windows and the upper "greenhouse" cabin top. These changes have to be made before the model is covered.

The cabin top is supported in front by music-wire cabane struts. Solder-on wire terminals secure the struts to the plywood carry-through member.

attach them with grooved blocks at the bottom and with a screw and two solder tabs at the top of each strut. When you have done this, add the remaining window frames, the instrument-panel former and the forward plywood decking between the firewall and the cabin.

Next, install the top fuselage stringers and the rear window frame sheets. Here again, I modified the fuselage so I would be able to add the large L-4 side windows. To do this, I replaced former F-6 with a spruce framework to support the upper stringers. I also removed former F-7 and installed a thin plywood "field-radio" support shelf. I replaced former F-8 with a new, longer one that I angled back about 30 degrees; it becomes the rearmost window-frame support. When the new parts and former were in place, I installed the top cross-pieces and the other scale window-support frames. The rest of the modifications were cosmetic changes to improve the model's scale outline.

To complete the fuselage construction, install the tail surfaces and the fuselage side stringers, attach and solder the landing-gear wires, add the tail-support wires, and frame and hinge the entry door.

WING

Wing construction is simplified by its flat-bottom ribs. Pin the bottom LE and TE sheeting and the forward bottom spar into place. The aft bottom spar requires 3/32-inch scrap balsa shims to lift it off the board. I used several ribs as "spacers" to correctly position the aft spar before I pinned it into place. The root rib is a balsa and lite-ply lamination that must be assembled before you glue it into place. It has to be angled outboard slightly to accommodate the wing's dihedral angle. Install the wing-attachment blind nuts and the alignment dowels before you glue the root rib into place.

Add the balsa LE, and use a razor plane to shape its top so it matches the ribs' top curvature then sand it smooth. Add the top spars, and then glue in the vertical-grain balsa shear webbing and the vertical TE piece that goes in front of the aileron cutout. So that it will match the rest of the

FLIGHT PERFORMANCE

Powered by an O.S. 1.20 4-stroke engine, the Balsa USA Cub has spirited performance. Any good .90 4-stroke would be perfect for scale performance. For gasoline power, a Zenoah G-23 would be just right.

• TAKEOFF

Don't jam the throttle forward! Advance it slowly, and keep the elevator at neutral. I find that with such a light airplane, if you hold up-elevator until it is traveling quickly forward, when you release the elevator, the tail comes up too quickly and you have to add up-elevator again to raise the nose before the model will lift off. Keeping the elevator at neutral and applying the throttle gradually allows the tail to come up slowly, and little, if any, rudder is needed to correct for prop torque. Once the model has broken free of the ground, let it gain airspeed before adding just a touch of up-elevator; this establishes a nice, shallow departure angle that looks more realistic than a steep one. I use just under ¾ throttle, and I save full power for loops and wingovers.

When you land, be mindful of wind direction; if there is a crosswind, lower the upwind tip slightly and control direction with the rudder. I like to fly the model in the approach at about ¼ throttle and really push the elevator down for a positive descent rate. Once the model is over the edge of the field, I pull the throttle back and add some up-elevator and level off for a wheel landing. Once on the ground, I push in a little down-elevator to hold the model on the ground until the tail comes down by itself. Three-point stall landings are also possible but are best saved for calm weather.

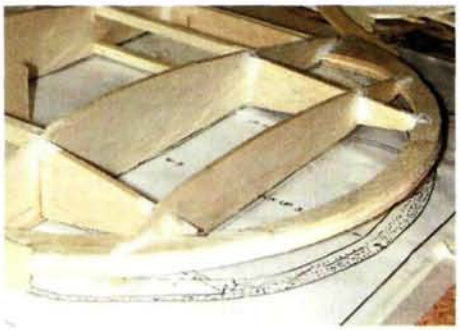
• GENERAL FLIGHT CHARACTERISTICS

Fast a Cub is not; flying straight and level at ½ throttle requires a fair amount of down-trim. High power settings mean up, and in a hurry! I like to use between ⅓ and ¼ throttle and then just watch the model fly around. For proper turns, rudder and aileron coordination is a must. On a calm day, a ¼-scale Cub makes a wonderful trainer; when the wind acts up, add more power and some down-trim to help it penetrate and to maintain airspeed. A lot of stuff hangs off this model, so you have a fair amount of drag to overcome; even so, you'll be amazed at how well a Cub will glide at idle.

• AEROBATICS

With so much lift and drag, the Cub should be flown in a way that maximizes its limited energy. One way to do this is to use gravity to help build airspeed. Before pitching the model up into a loop or a barrel roll, add power and push the nose down to enter a shallow dive. This is what the full-size airplane has to do (and it's scale performance). With any amount of power, there is little danger of a Cub tip-stalling as long as you keep the nose down slightly.

To stall the wing—to enter a spin, for instance—pull the power to idle, and slowly apply full up-elevator to slow the model; then as it almost stops flying, add full aileron and rudder. In a true spin, you'll be impressed by how quickly that big 8-foot wing spins around. Exiting the maneuver is easy and requires that you first neutralize all the controls and apply power. Once you've added a little "up," the model will be back to straight and level. Wingovers are also very easy to do. For any aerobatics, it is important to have plenty of control throw. Use the instructions' recommended throws, fly smoothly and have fun.



The wingtip bow is made of laminated balsa and lite-ply die-cut parts. The wingtip rib is a modification. The plan does not include the secondary tip rib; I added it for scale appearance.

wing, the aileron is built in place in the cutout area. Be sure to angle the aileron's LE to achieve the proper beveled angle. Add the top LE and TE sheeting, the capstrips and top sheeting, the plywood hard points and the die-cut wingtip pieces, and that completes the wing panel. Repeat the steps to make the other panel.

With the two panels built, you can hinge (but don't glue) the ailerons into place and install your aileron servos and control linkage. To support my servos, I made flush-fitting lite-ply plates in the bottom of the wing and then added balsa frames around the plates to support the covering. The servos are attached to the plates with plywood tabs and screws.

After you've finished the wing panels, build the wing lift struts and shape them into smooth airfoil cross-sections. Don't forget to cross-pin the aluminum attachment tabs to the ends of the struts; this ensures that the tabs won't be pulled out while the model is flying. Drill the attachment holes in the aluminum tabs.

WING ATTACHMENT

To attach the wing panels to the fuselage, turn the fuselage upside-down and place it on a padded surface. Attach each panel with cap-head screws, lightly tightening them by hand. Attach the lift struts to the landing-gear support plate on the fuselage bottom, and mark attachment-bolt-hole positions on the wing. Do not drill them yet! Take everything apart and, with someone's help, right the fuselage, reattach the lift struts and the wing panels, and block the wingtips up to the proper dihedral angle. Make sure the fuselage rests flat on the workbench and that the dihedral angle is the same on both wing panels. Measure upward from the building board to the tip ribs; the distances should be the same.

Carefully drill through the front lift strut-attachment holes and into the wing's plywood hard point, install the blind nut, and bolt the front struts to the wing. Check the dihedral again. Now do the same for the aft struts. While you do this, be sure you don't twist or warp the wing. Finish the strut attachment by installing the small jury strut wires. These increase the struts' strength and prevent them from vibrating when the engine is running.

ENGINE AND RADIO

The engine cowl comes in two halves that must be glued together; then add filler putty to smooth the seam. I took the easy way out, and I bought a replacement fiberglass cowl from Steve Weber of Aeroglass. Steve offers cowls with and without molded-in engine detail; and I used the detailed cowl.

I installed my O.S. 1.20 4-stroke engine inverted on aluminum Du-Bro rubber-isolated mounts and used a steel cable for the throttle linkage. I installed the throttle servo in the front of the cabin just under and in front of the front edge of the cabin door. The rest of the radio gear sits on rails under the pilot's seat. To cover the servo wires and the McDaniels onboard glow driver, I installed a removable cabin floor that supports a scale front seat and a control stick. With the pilot and front seat in place, the radio gear is hardly visible.

It is best to install the elevator and rudder pushrods now before you cover the model. I used simple 5/16-inch birch dowels with 4-40 pushrod wires attached to each end. I support the dowels with scrap balsa sticks to prevent them from vibrating and from bowing under load—a very simple, trouble-free setup.

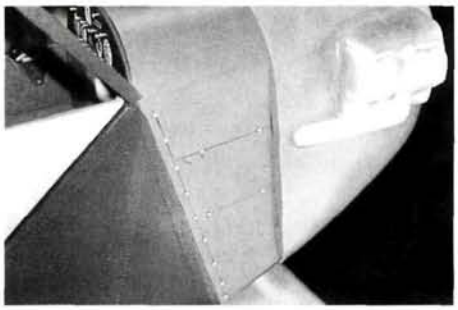
COVERING AND FINISHING

To finish all my scale models, I use Stits Lite fabric and Poly Tone paint from F&M Enterprises—easy to use and very forgiving, even on very humid days. To attach the cloth, you must first apply the Poly Tac adhesive to the frame; then push the cloth down onto the wet glue. Follow the Stits Lite instructions, and you will be very pleased with the results. Just be sure to remove all the wrinkles before you apply heat to tighten the material.

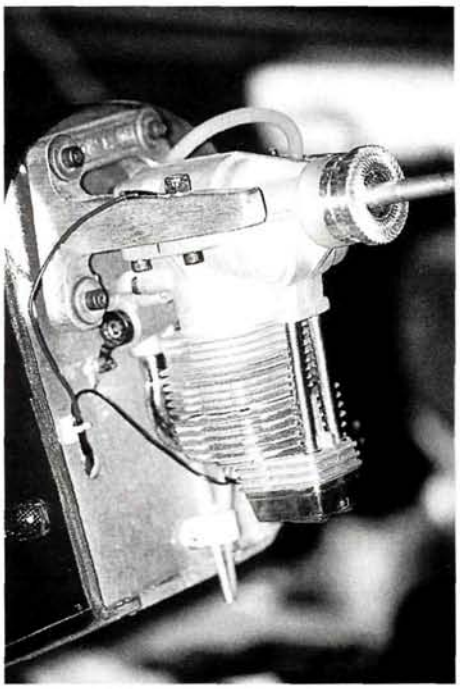
Brush on two coats of the Poly Brush fabric primer, and allow it to dry for about 2 hours. Add surface details such as rib stitching and pinked tape, then apply another coat of Poly Brush over these details. Spray on two light coats of the silver Poly Spray undercoat and let it dry. I added a boot cowl between the firewall and the cabin; I made this of thin lithoplate aluminum sheet, and I glued it into place over the fabric with 3M 77 spray adhesive. Then I added small screws to hold it firmly in place.

I sprayed medium gray Poly Tone paint on the under-surfaces and dark medium green (not olive drab) on the sides and top surfaces. All the white stripes and aircraft markings were masked off and sprayed on. The national insignia and the 82nd Airborne chevrons are vinyl decals and come from Model Graphics.

To install the windshield, cut out and use the pattern shown on the plans and make a stiff paper template. Use it to see whether the shape will work; tape it into place, alter it until it fits nicely, then transfer it to the clear plastic sheet and trace around it with a fine-tip marker. Cut out the plastic-sheet windshield and install it on the model. Use a covering heat gun and carefully heat the



To enhance scale fidelity, I added lithoplate aluminum sheeting to the fuselage between the firewall and the instrument panel. Small screws hold the aluminum in place, just as is done on the full-size airplane. Note the fiberglass engine cowl with molded-in engine detail.



I use an O.S. 1.20 4-stroke engine to power the Cub. Because the engine is fairly long, I repositioned the firewall farther back so the prop shaft's washer would be in the correct position relative to the front of the engine cowl.

plastic-sheet "windshield" to bend it more easily into shape; then clamp it into place with clothespins and let it cool. Trim it as necessary for a good fit, then glue and screw it into place with Pacer 560 canopy glue. I used small Nelson Hobby Specialties screws to secure its side edges. Install the rest of the windowpanes, and add strips of lithoplate or thin plywood to form the frames; then mask the windows and paint the frames to match your model.

I made the curved fairing that covers the bottom edge of the windshield by masking the area with tape, adding several layers of Anchor Bond epoxy filler and smoothing it with my wetted fingertip. Before the epoxy had cured, I removed the tape and cleaned up the edges. The next day, I added small screws and painted it to match the boot cowl.

The finishing scale touches for the L-4 are the instrument panel, a detailed static prop, a gasoline filler cap with sight gauge wire, a footstep, a pitot tube and fake pulley, and aileron cable details on the front lift struts.

The Balsa USA Piper Cub is a great model for anyone who wants an easy-to-fly ¼-scale model. It can be built as simply or as highly detailed as you like, and it offers an excellent way to get into scale competition; all you need is some documentation before you start building. In either civilian or military markings, you just gotta love a Cub!

__Aeroglass__, Box 185, Langton, Ontario, Canada NOE 1GO; (519) 875-1533; fax (519) 875-1855.
__Anchor Bond__; distributed by __Anchor Seal__, 16 Riverside Ave., Danvers, MA 01923-3281; (978) 774-5217; fax (978) 774-0638; www.anchorseal.com.
__APC Props__; distributed by __Landing Products__, 1222 Harter Ave., Woodland, CA 95776; (530) 661-0399; fax (530) 666-6661.
__Balsa USA__, P.O. Box 164, Marinette, WI 54143; (906) 863-6421; fax (906) 863-5878; www .balsausa.com.
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__Model Graphics__, 121 Cove Rd., Hemphill, TX 75948; (409) 787-2875; fax (409) 787-4216.
__Nelson Hobby Specialties__, 394 SW 211th Ave., Aloha, OR 97006; (503) 629-5277; fax (503) 645-1492.
__Officers and Gentlemen__, Box 537, RD 2, Hampton, NJ 08827.
__O.S.__; distributed by __Great Planes Model Distributors__, P.O. Box 9021, Champaign, IL 61826; (800) 682-8948; fax (217) 398-0008; www .osengines.com.
__Pacer Technology__, 9420 Santa Anita Ave., Rancho Cucamonga, CA 91730; (909) 987-0550; (800) 538-3091.
__Zenoah__, 4105 Fieldstone Rd., Champaign, IL 61822; (217) 355-9511; www.horizonhobby.com.

MODEL AIRPLANE NEWS
FIELD & BENCH
REVIEW

ART HOBBY

Elster HLG

by Richard Loud

SPECIFICATIONS

Model: Elster-V 1.5 HLG

Type: hand-launched glider

Manufacturer: Art Hobby

Distributor: Global Hobby Distributor

Airfoil: HN 1033 modified

Wingspan: 59 in.

Wing area: 328 sq. in.

Weight: 9.5 to 11.5 oz.

Wing loading: 5.3 oz./sq. ft.

Length: 34 in.

Radio req'd: 2-channel with three microservos

Radio used: Futaba 8UAF with Hitec 555 micro receiver, one Cirrus CS 20BB servo (elevator) and two Cirrus CS 10BB servos (ailerons), WattAge 4-cell, 150mAh Ni-Cd pack

List price: $179.99

Features: presheeted foam-core wings, lightweight fiberglass fuselage pod, carbon-fiber tail boom and a prehinged elevator. This model also offers a high degree of prefabrication.

Comments: the craftsmanship of this kit is apparent as soon as you open the box. It is an excellent choice for intermediate and advanced pilots who are looking for a high-performance HLG with minimal building time.

Hits
- High degree of prefabrication.
- Beautiful craftsmanship.
- Excellent flight characteristics for thermal and slope.

Misses
- Instructions don't cover some fine points of assembly.
- No finger pegs or finger holes for launching.

Exceptional prebuilt glider

In German, "Elster" is the word for a bird we know in the U.S. as a magpie. In model aviation, the Elster is the latest 1.5-meter, 80-percent prebuilt hand-launched glider from Art Hobby and distributed by Global Hobby Distributors.

Hand-launched gliders are a relatively new addition to the arsenal of the RC sailplane pilot. When I built my first Gentle Lady back in 1980, all we had to choose from were built-up-wing polyhedral thermal ships. Things have come a long way; now we have a sailplane type for every flying condition, and hand-launched gliders (HLGs) are one of the few types of model that every serious sailplane pilot always has with him.

Opening the box, I was amazed by the craftsmanship of the wings; they're presheeted with black poplar veneer. I later read the box cover, on which the wings are likened to a fine musical instrument. I think a master violinmaker would be proud of them. I set aside the glorious wings and found a very complete, well-thought-out kit—from the painted fiberglass fuselage pod and carbon-fiber boom to the prehinged V-tail halves, the kit included nearly all the required hardware. All it lacked were threaded rods and clevises for aileron pushrods and hinge tape for the ailerons.

There isn't a lot to constructing the Elster. According to the plan, the first step is to make a fuselage assembly jig out of scrap balsa and a flat board or a piece of cardboard. I considered skipping the jig but realized that it was so simple to make, it would be foolish not to do it. It was also a good idea because it can act as a cradle to hold the fuselage in future assembly steps.

The important thing in the construction of the V-tail is to get the angle right. The hard balsa center strip and the root edges of the stabilizers are all beveled to the correct angle, so assembly is no problem. But trusting the angle to such small bevels is not really a good idea, so I made a 35-degree template out of stiff cardboard. I clamped the center strip to the bench and held the template under each stabilizer; this ensured the correct angle for each half. I sealed the joint with thin CA, then reinforced that joint with fiberglass cloth and more CA.

The Elster's V-tail uses two clever clip-on mounts. This allows you to easily adjust the stabilizer relative to the fuselage. First, screw these mounts to the stabilizer and then clip the whole unit onto the boom. Don't be misled by the mounting instructions, however. If you install the tail with the clips positioned as they are shown on the drawings, then the control horns—which you will install later—will interfere with the end of the boom. Do not mount the tail with the boom extending to the elevator hinge line. Instead, mount it so that the boom ends just beyond the aft mounting clip. Once satisfied with the alignment, fix the stabilizer's position with a few drops of thin CA.

Because the ailerons will be hinged with tape, it's best to seal the wings with clearcoat, paint, or varnish before you cut the ailerons free. To show off the beauty of the black poplar veneer, I used a clear, water-based Minwax polyacrylic varnish. I applied two very thin coats with a soft cloth and sanded it with 400-grit sandpaper.

The manufacturer was kind enough to draw the outline of the ailerons on the upper surface of the wing, so you need only a very sharp knife blade and a metal straightedge to cut along the lines. The manufacturer also had the foresight to install a balsa strip inside the wing at the leading edge of the aileron. That means if you cut along the lines, the aileron will already have a balsa face ready for shaping. If you want to be sure, hold the wing up to the light and look through it; you will see the shadow of the balsa.

The Elster comes with presheeted foam-core wings, prehinged elevators, painted fiberglass fuselage pod, a carbon-fiber boom and a complete hardware package.

The aileron servo pockets are also premarked. The aileron servos will need extension wires at least 20 inches long, and as there is very little room in the wing for connectors, it's best to hardwire extensions into the servo leads. A passage for the servo lead is precut, so all you have to do is thread the lead to the wing root. I mounted Cirrus CS-10 BB servos to the upper sheet with GE Silicone II glue.

To mount the wing, I cut two small holes in the top of the fuselage. I positioned one hole where the servo leads exit the wing. The other hole provided access to install the screw plate for the wing bolt. I chose to make two small holes so I wouldn't

compromise the fuselage structure. This is a narrow fuselage, so installing the screw plate requires patience and tiny fingers. I have neither, so I substituted hemostats for the tiny fingers. (I haven't yet found a substitute for patience.)

It takes nothing more than a good, hard throw to launch the Elster HLG. It is easy to attain altitudes of 30 feet or more—plenty high enough to snag thermals.

Because this is a 2-channel model, radio installation is simple but tight. I used a Hitec Micro 555 receiver with the case removed, a WattAge 150mAh receiver battery and a Hitec micro switch. Even though I chose the Hitec 555 for its small size, I still had to remove the case to adequately fit the receiver inside the fuselage. After some fiddling with the position of the components, I mounted the Cirrus CS-21 BB elevator servo with GE Silicone II.

The only real difficulty I encountered while installing the elevator pushrod was in gluing down the aft end of the housing because it is relatively deep inside the tail boom. I finally drilled a tiny hole in the underside of the boom just ahead of the tail and ran a loop of thread through the hole and around the housing. I then pulled on the thread, which in turn pulled the pushrod housing to the bottom of the boom. It took only a few drops of thin CA through the hole to secure it in place.

The elevator servo was mounted with silicone.

The wing with the aileron cut free. Since the aileron is cut right out of the wing, the match is always perfect. The wing comes with an inlaid balsa strip which, when the aileron is cut per the plan, creates a sub-trailing edge in the wing and a facing for the aileron.

After I had installed the radio, I determined that I needed ¾ ounce of nose weight to get the CG in the recommended range. This was a surprise, as the overall weight is such a factor in hand launching.

On my first day out with the Elster, I logged nearly an hour of "transmitter on" time between numerous launches and landings. When I was nearly finished, I suddenly realized I hadn't touched the trim settings, yet the Elster had tracked straight and level with my thumb off the stick. I can't take credit for this level of performance—if truth be told, it doesn't take a lot of skill to build this plane.

If you're in the market for a hand-launched glider and want one that's equally at home on the slope or at the thermal field, you should look into the Elster. You won't be disappointed.

Cirrus Ventures, *115 Hunter Ave., Fanwood, NJ 07023-1030; (908) 322-7221.*
Futaba Corp. of America, *exclusively distributed by* ***Great Planes Model Distributors Co.,*** *P.O. Box 9021, Champaign, IL 61826; www.futaba-rc.com.*
Global Hobby Distributors, *18480 Bandilier Cir., Fountain Valley, CA 92728-8610; (714) 964-0827; fax (714) 962-6452.*
Hitec RCD Inc., *12115 Paine St., Poway, CA 92064; (858) 748-6948; fax (858) 748-1767; www.hitecrcd.com.*
WattAge; *dist. by Global Hobby Dist.* ✦

FLIGHT PERFORMANCE

• TAKEOFF AND LANDING

Because this is a hand-launched glider, takeoff is self-explanatory. Flying off a slope, the launch is nothing more than a gentle toss into the breeze. For thermal flying, where launch height is critical, you need to straddle the fuselage with your second and middle fingers and position them on the trailing edge of the wing. This is a stable place that you can grip firmly for a good, hard, overhand throw. Add down-elevator to prevent a stall, and it's off hunting for thermals; it's that simple.

On my first toss, I had expected a simple, straight-ahead glide to a landing, but the Elster flew a full 360 degrees around the field and landed at my feet—shades of good things to come. My second toss was with full throttle, and the Elster tracked straight out with a gentle climb to about 30 feet.

As with any other aileron elevator sailplane, you need to keep enough airspeed through the pattern to ensure crisp aileron authority. On the final approach, just hold it off until it greases onto the grass. With a little practice, you can fly a high final and pull the nose up right in front of you for a hand catch. Then you'll be ready for another launch right away.

• LOW-SPEED PERFORMANCE

Tracking at low speed is arrow straight, but what a glider really needs is the ability to turn—often in very tight circles—at minimum airspeed. This is where the Elster surprised me the most. I expected performance more like that of a slope ship and, without a rudder, I expected I'd have to work hard at turning in a thermal. It turned out that thermal turns are as flat or as steep as you want them to be, with no noticeable adverse yaw. If you need to raise the inside wing, a little opposite aileron does it; the turn continues, but a little flatter. You'd swear there was a rudder.

Straight-ahead stalls have a gentle break, and the plane looks as if it's standing still just before it happens. If you slow down too much in a turn, the inside wing will stall fairly abruptly, but recovery is usually within one wingspan. Since the Elster flies slowly to begin with, speed can be a little deceiving; the line between slow and too slow can be difficult to perceive. Just be aware of it, and remember: it's better to fly a little faster in a thermal than to stall and lose the altitude you've worked so hard to gain.

• HIGH-SPEED PERFORMANCE

Since this is a 12-ounce plane, high speed is relative at best. When you put its nose down, it will certainly start scooting along. Tracking is straight, with no tendencies to climb or dive. A hard yank back on the elevator resulted in a fast climb with no indication of a tip stall.

• AEROBATICS

With the initial control throws set per the instructions, there isn't enough aileron authority to do much more than turn. After cranking the throws up to just about as far as they'll go, rolls are possible, although they require considerable airspeed. This means you either have to be flying on a slope, or you'll need a preparatory dive at the thermal field. The same goes for loops. Inverted flight requires a fair bit of down-elevator, and with its relatively flat wing, there's no tendency to roll out.

FMA DIRECT

Park Razor

by Bob Aberle

User-friendly flying wing

Well-known for its aftermarket RC receivers, FMA Direct recently introduced the Razor series of flying wings. Made of a durable, resilient molded foam, these ARF models range from non-powered gliders to a Speed 600-powered model. The subject of this review, the Park Razor, has 3-channel control and comes with a small Speed 280 motor geared approximately 3.5:1, an FMA Mini-20 ESC, a 7x5.7-inch prop and a 7-cell, 600mAh Sanyo Ni-Cd battery pack. You can also buy it as a package with an FMA Fortress micro receiver and two FMA S-80 or S-100 microservos.

The Park Razor has vertically mounted winglet plates at each wingtip that act as vertical fins. An equipment bay molded into the center of the wing holds the RC equipment, motor and battery. Control is exercised through a set of elevons that are controlled by two channel functions: aileron for roll control (one surface goes up, the other goes down) and elevator or pitch control (both surfaces go up and down). By using your transmitter's mixing function, you can control roll and pitch simultaneously, e.g., you can get a right-turning bank (using the transmitter aileron stick) and, at the same time, haul back on the elevator stick to pull the wing around in the turn. If your transmitter doesn't have a mixing function, you can buy FMA's subminiature onboard mixer, MX80.

SOME ASSEMBLY REQUIRED

Total assembly time is only about two hours. The wing comes in halves that you cement together; be sure to sand the joint first with the supplied sandpaper so the recommended 5-minute epoxy will stick better.

When the wing halves have been joined, a long slot in the center section accepts the battery pack. I had to position the pack 1 inch back from the front of the battery compartment to achieve the correct center of gravity. The battery is press-fit into place and will stay where you put it.

SPECIFICATIONS

Manufacturer: FMA Direct
Model: Park Razor
Type: sport electric ARF
Wingspan: 48 in.
Wing area: 448 sq. in.
Weight: 20.2 oz.
Wing loading: 6.5 oz./sq. ft.
Motor: Speed 280 geared 3.5:1 (included)
Prop: 7x5.7 (included)
Motor current: 8.3 amps
Battery: Sanyo 7-cell 600mAh pack (included)
Radio req'd: 3-channel with 2 servos
Flight time at full throttle: 5 minutes
List prices: $44.95 (basic airframe); $109.95 (package I, including motor and power pack); $209.95 (package II, including motor, power pack, receiver and two servos)
Features: elevon flight control, two-piece foam wing construction, molded ABS plastic motor mount and canopy; 2-hour assembly time.

HITS
- Fast, easy assembly.
- Rugged construction.
- Available with complete power system, ESC, receiver and servos.
- No soldering required.

MISSES
- Motor and battery get quite hot during flight.
- Instructions not illustrated.

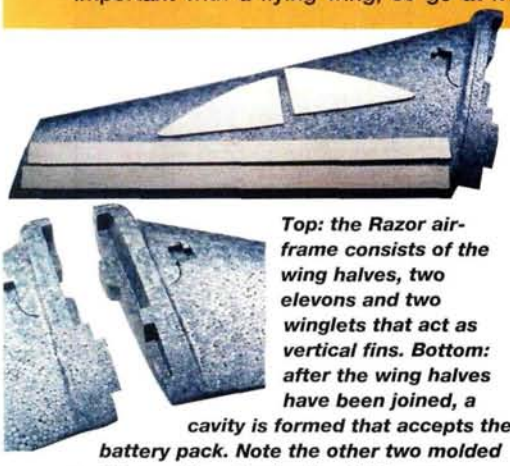
FLIGHT PERFORMANCE

In addition to the correct control throw and CG position, the instructions advise you to set both elevons at a +2 degrees upward angle in the neutral position. Set this reflex position by adjusting the two clevises (one on each control wire leading to the control surfaces). This control setting is important to a flying-wing design.

When hand-launching the Razor, you must be careful not to come into contact with the prop, which is in the rear. To be on the safe side, hand-launch the Razor with the motor off; this is much like test-gliding the model. Then, as soon as it leaves your hand, hit the throttle to start the motor.

To my delight, the Park Razor took right to the air. Trim is very important with a flying wing, so go at it carefully. Once trimmed properly, the Razor was very smooth and responsive in flight but not oversensitive. It did not require any exponential rate control. The Razor is also quite fast yet can be throttled back without any sign of a stall. Of course, when you do throttle back, the flight time is extended.

Standard aerobatic maneuvers such as loops, rolls and inverted flight can easily be accomplished, but the model's control surfaces warped, and its roll rate changed markedly—so much so that the Razor would roll to the left but not to the right. I suggest that you cover those control surfaces to make sure they don't become warped due to moisture. Landing the Razor is also a pleasure because it can be slowed down considerably and will still handle with authority.



Top: the Razor airframe consists of the wing halves, two elevons and two winglets that act as vertical fins. Bottom: after the wing halves have been joined, a cavity is formed that accepts the battery pack. Note the other two molded cavities on the wing for the S-80 servos.

The kit comes with an ABS plastic motor mount/equipment tray; the lip of this tray is epoxied to the edge around the battery compartment, and the center of the tray can be lifted to allow access to the battery. I attached the receiver and ESC to the top of this flap with hook-and-loop fastener. An ABS plastic canopy covers the receiver and speed control and is attached with hook-and-loop fastener. I press-fit the S-80 servos into cavities in the wing panels and covered them with clear Lexan tape. The servo cables are pressed into small channels cut into the foam leading up toward the receiver.

Final assembly involves hinging the elevons using the supplied thin (0.005-inch-thick) clear Lexan tape. My kit came with only the thicker (0.010-inch) clear Lexan tape that's used to structurally enhance the wing; this is far too stiff to use as a control-surface hinge and would likely over-stress the servos. Be sure to use tape of the proper thickness for the specific application. I suggest that you also cover the elevons with an iron-on material, such as Super MonoKote. I didn't do that initially, and the surfaces eventually got wet and became warped. Both wire control rods come bent to shape and include the necessary hardware.

The receiver antenna exits the side of the canopy and runs along the top of one wing panel. It is held in place with strips of the clear Lexan tape.

The flap of the RC compartment—under which the battery pack rests—is closed here. The receiver (right) and the Mini-20 ESC are mounted on top of this flap with hook-and-loop fastener. Note how the two servo cables run through channels cut into the foam. The motor is toward the rear, and all the wiring has been done for you.

The motor is mounted on the ABS tray with double-sided tape and a single nylon tie. It is very secure. Be sure to provide a path for the battery cable from the ESC so that it can be plugged into the battery.

As a guideline, when the airplane is finished and ready to fly, the aileron function (of my elevons) allows the control surfaces to move up and down ½ inch (on either side of neutral). Using the elevator function, the surfaces go up and down approximately ⅜ inch.

FINAL THOUGHTS

At the start, I measured the motor current at 8.3 amps and 6,300rpm with the supplied 7x5.3 prop. Using the 600mAh supplied battery, the flight time is about 5 minutes. At 8 amps, the Speed 280 motor and battery pack will get quite warm during a flight. To help this, an addendum to the instructions suggests that you drill a vent hole in the front of the plastic canopy. This will allow air to enter, pass over the motor and exit at the rear. I also suggest that you allow the battery to cool down after each flight before you recharge it; it helps to have several battery packs.

The FMA Direct Park Razor is an excellent example of how an electric-powered model can be ready to fly in a few hours. It also provides sensational flight performance. If you've never flown a flying wing, here is your chance to try something very maneuverable yet still easy to fly. This model has absolutely no bad tendencies.

__FMA Direct__, 9607 Dr. Perry Rd., Unit 109, Ijamsville, MD 21754; (800) 343-2934; fax (301) 831-8987; www.fmadirect.com.
__MonoKote__; distributed by __Great Planes Model Distributors Co.__, P.O. Box 9021, Champaign, IL 61826-9021; (800) 682-8948; fax (217) 398-0008; www.greatplanes.com.
__Sanyo__, 2055 Sanyo Ave., San Diego, CA 92173; (619) 661-6620; fax (619) 661-6743. ✈

Paint models with latex

by Roy Vaillancourt

Roy Vaillancourt's beautiful warbirds all have one thing in common: they're finished with household latex paint!

An inexpensive, safe finishing alternative

Environmental concerns increase daily, and we now know that many materials we use are not environmentally friendly. Many solvent-based paints are high on the list. As the EPA and other agencies have removed these substances from the store shelves, we must find suitable alternatives. Latex paint is non-toxic, allows your spray equipment to be cleaned up with ordinary soap and water rather than harsh chemicals and is much better for the environment than solvent-based paint.

I began to use latex to finish my airplanes in 1983. After a mishap with my P-47 Thunderbolt, I needed to repair and repaint it. At the time, I was using K&B SuperPoxy paint, but when my Benjamin Moore paint dealer told me he could match all my scale colors perfectly—for about an eighth of the cost—I had to give it a try!

After making the repairs, I did all the usual panel lines and rivet detail as before, and I repainted my Thunderbolt in the same scheme. I applied the latex over conventional automotive primer. Most surprising was that the plane *lost* weight after the process. In all, my 92-inch-span Jug weighed 4½ pounds less than before. Whoever heard of a model *losing* weight during a repair?

When you use it, latex feels thick and heavy compared with other paints; actually, it produces a lighter finish once it has dried, and it generates very little overspray. Latex doesn't like to be wet-sanded; it will begin to roll up if it gets wet for too long. I found that, with some practice, I could sand a latex finish successfully to a fine, feathered edge. Latex can also be applied directly to unprimed, fabric-covered areas. I use SuperShrink Coverite; latex sticks to it as though it was made especially for it. The nice thing is that even if the fabric sags or gets dinged, you can simply reapply heat and shrink the fabric tight again without affecting the paint. Since it's a rubber-based paint, latex does not crack because of vibration or the

Above: latex sticks to fabric covering as if it were made for it. You can also apply light coats over dark coats with no problem. Below: the author has also used latex on unprimed, fiberglass-covered models such as his L-19. Scuff-sanding the surface really makes latex stick! Here, the model is completely finish-painted with all its markings added. Epoxy paint can be applied over the latex finish, but it must be added in light coats. Using solvent-based paints over latex can harm the finish.

COMPRESSORS AND SPRAY GUNS

I use an old Sears, Roebuck and Co. ½hp compressor. It provides plenty of air pressure and keeps up nicely with my gun's requirements. Even some of the better diaphragm compressors will work well. Just be sure your equipment can supply enough air to properly feed your gun. Make sure your compressor has a water and oil trap; oil in the paint will cause "fisheye" blemishes. Also, use an air-pressure regulator so you can control the airflow through the spray gun. This allows you to vary the amount of paint applied when you pull the trigger.

I use several types of spray guns. Try to match the size of your spray gun to the size of the paint job. For big areas such as wings and fuselages, I apply the base colors with an automotive "touch-up" gun that has a medium needle and orifice. For finer work, I use an airbrush. All types of spray guns will work with latex paint.

Several types and sizes of spray guns can be used with latex paint—from the smallest airbrush to the largest, heavy-duty automotive touch-up gun.

expansion and shrinkage of parts.

We have all been taught that you're supposed to apply light colors first, followed by darker ones, but with latex, this is not necessary. When I painted my fabric-covered, Stinson L-5, I first painted the whole model Olive Drab (OD), then added the light gray underside colors over it. I did this so the inner surfaces of the cockpit would match the outside color, and the OD latex showed through the fabric very nicely. The plane required three coats to cover, and the light gray required two coats to cover the OD areas. Talk about breaking all the rules! Latex also holds up very well when it's applied to fabric; after 10 years of flying, the plane looks as good as the day it first left the shop.

I have also used latex over unprimed, fiberglassed surfaces with good success. For my L-19 Bird Dog, I sanded all the primer off except where panel lines and hatches were. I scuff sanded the glassed surfaces with 280- and 320-grit sandpaper, and the paint stuck as if it were welded on! Epoxy paints used for aircraft markings can be applied over a latex finish if you don't flood the epoxy paint on. If you saturate latex with anything containing acetone or toluene solvents, it will turn it into a rubber-cement-like goo.

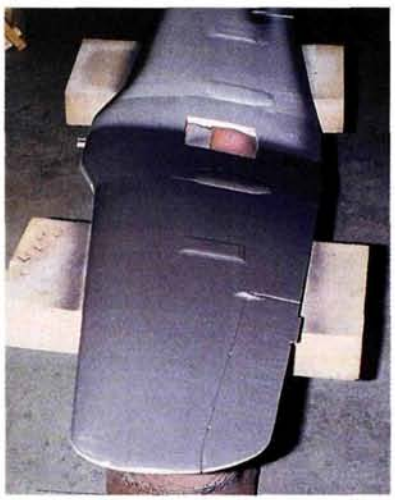
APPLYING LATEX

When it's time to paint, be ready to play with the air pressure. For either a touch-up gun or an airbrush, I start with about 20psi of air pressure, although this can vary by 5psi depending on the brand of paint and how much pigment it contains, the amount of thinner added and even the color being used.

I start by adding about 20 percent thinner to just a bit of paint; then I test-spray it onto a piece of glass. If it doesn't flow properly, I increase the air pressure a bit. If it still doesn't flow through the gun, I put the air pressure back to where it was and add thinner. If the paint "spits," I add more thinner. If it comes out wet and runny, I add some more paint. The idea here is to use a small jar of paint to find the correct mix ratio for that color. Adjust your gun for low paint flow. If you get runny stuff even at low-flow settings, then you have added too much thinner. If it comes out dry-looking, increase the flow of paint or add thinner. Very rarely will you use less than 15psi of air pressure. Do not spray paint with more than 30psi air pressure; this will cause too much overspray.

When you use latex, the weather doesn't matter. I usually paint in my basement shop in the winter; the temperature there is usually about 55 degrees (I like it cool). I have sprayed latex on rainy, cold and damp days, and results are the same as on sunny

Here, the model has been completely painted and awaits the addition of scale markings. Don't put your model together too soon after painting on warm, sunny days; the parts can stick together if the paint hasn't fully dried.



Above, top: here, the base color coat has been applied to the wing. Try to match the size of your gun to the size of the painting job you're doing. A touch-up gun is perfect for large surfaces. Center: when you apply latex, spray on the first coat very lightly, then speed its drying time with a heat gun. Apply two more coats, drying each, and then let the paint dry overnight. Bottom: here, the next color is being applied to the fuselage. Note that all the panel lines and rivets have been added, and the latex is being applied in light coats to avoid covering the fine details.

TYPES OF PAINT

I have used high-gloss, flat- and satin-finish paints, but I have had the best results with Benjamin Moore's semi-gloss, exterior-grade paint. Whichever brand you choose, be sure to use exterior grade. Interior paints don't hold up well to the abuse we modelers can dish out. Latex will be dry to the touch in about 15 minutes and can be masked over in about 6 hours. A nice feature of the paint is that its drying time can be accelerated with a heat gun. After 6 hours, if you press on the surface with your fingers, you'll leave small prints on the surface. This is not a problem, as they will disappear in about 12 to 24 hours. After two or three months, however, this characteristic disappears, and the paint becomes as stable and as tough as epoxy or lacquer while still remaining flexible on fabric.

Latex paint is non-toxic and very inexpensive. You can get any custom color mixed at a paint store.

If you are going to use a gas engine, latex doesn't need a clear top coat; after it has fully dried (24 hours), it's completely compatible with gasoline. If, however, you are using a glow engine, you'll need to protect the finish with a clear epoxy or polyurethane top coat after it has dried fully.

Where do you get custom colors mixed? I take the color chips from my scale documentation package and give them to the guy at the local paint store. To match the colors, he places them in front of an optical spectrometer. This neat, computer-controlled device shines a light on the chip to analyze it. In a few minutes, the machine produces a formula for mixing the paint. The paint guy mixes it up, and I'm on my way. One quart of custom-mixed paint generally costs between $8 and $14 and is enough to paint about five planes!

THINNER

Naturally, you would expect to use water as a thinner, and it works OK. I use an alcohol/water mixture that's better known as "windshield-washer fluid"! That's right; even the cheap stuff from a gas station works great. This fluid has detergent in it, which "thins" the water (breaks its surface tension) and slows the drying process. The alcohol evaporates quickly and leaves the detergent, water and paint behind. The water evaporates next, leaving the detergent and paint. Slowing the drying time a bit gives the paint has more time to flow out and cover the surface more evenly. Once fully cured, latex can be weathered and treated just like lacquer paint.

The only additive I use is one called Floetrol. This is a latex paint conditioner that helps the paint flow without running and acts as a lubricant for spray guns. It slightly reduces the sheen of the paint, but this is not a concern. A little goes a long way, so use only 2 ounces of conditioner for each quart of paint.

PAINT MODELS WITH LATEX

July days. In fact, latex seems to be easier to work with on cold, damp days. I just keep a heat gun around to accelerate the drying time between coats.

On cold days, I spray the first coat on just heavily enough to barely see some coverage. I then dry it with the heat gun and spray the second coat on just a bit wetter. After drying that coat, I spray the third coat then go upstairs and let the paint dry overnight. The next day, I go over everything with the heat gun once more just to make sure it's completely dry.

MASKING

Use good, low-tack 3M masking tape. Don't use cheap stationery-store-grade masking tape, or you'll get poor results. After masking and covering all the surrounding areas, lightly spray along the taped edge. Dry this coat with the heat gun and repeat the process two more times before doing the rest of the painted area. Dry the paint again with the heat gun and be sure to thoroughly dry the area next to the tape. Remove the

When masking parts, use a good-quality, low-tack masking tape. Bargain-brand tape gives poor results.

tape and call it a day so the paint can continue to dry overnight.

Time is the most important ingredient for the paint to completely dry, though sunlight does seem to speed the "hardening" process. When I have finished painting a model, I set it out in the sun to help "cure" the paint. One note here: if you assemble your plane too soon after painting it on a hot day, the wing and fuselage may stick together. To prevent this, I use baby powder on the wing saddle the first few times I assemble the model.

Another really neat thing about latex is that if you don't like your paint job, you can wash it off with a damp rag before it dries. You can then dry the model with your heat gun and start over. Also, if some hair or a bug gets stuck on it, you can carefully pick out the offender with some tweezers without harming the paint. In the morning, the paint will have spread to cover the spot you touched.

To sum up, latex is not just for houses! It is a very good, inexpensive and non-toxic paint for our models as well. If you want to try latex on your next model but have a few questions, contact me c/o *Model Airplane News*. I'll be glad to help you out.

Coverite; distributed by Great Planes Model Distributors Co., P.O. Box 9021, Champaign, IL 61826-9021; (800) 682-8948; fax (217) 398-0008; www.greatplanes.com.

Here, the model is completely finish-painted with all its markings added. Epoxy paint can be applied over the latex finish, but it must be added in light coats. Using solvent-based paints over latex can harm the finish.

Once *fully dried, latex can be weathered and sanded just like any other paint. Simply allow the finish to dry fully, and take your time. Don't use too much water when wet-sanding,*

PLANES WORTH MODELING

3-View Documentation for Scale Modelers *by DKKvan Mourik*

Morava L-200

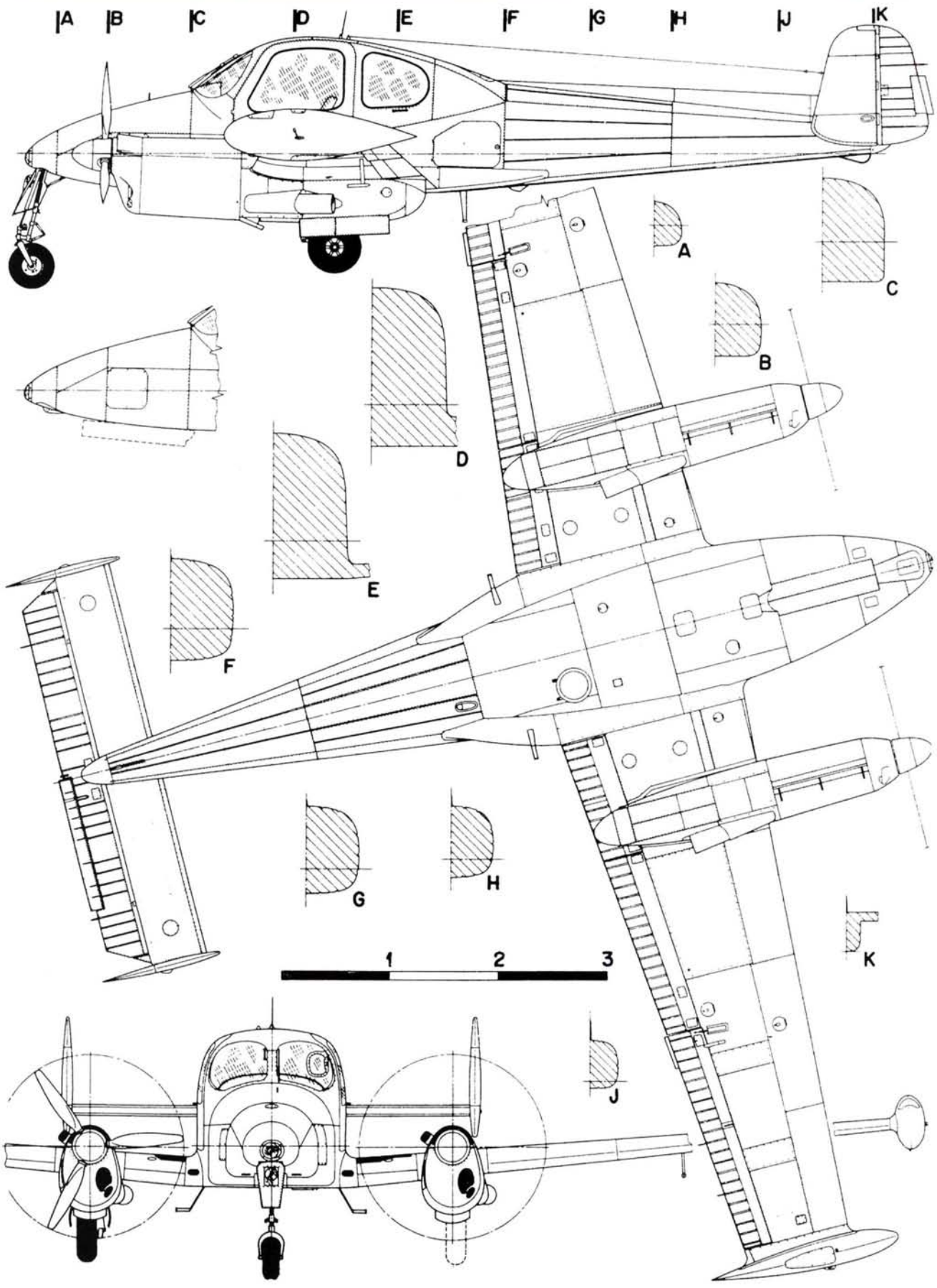
As the second World War came to a close, the prospect of using aircraft for everyday public transportation was becoming increasingly likely. Noise and pollution restrictions were concerns of the future, and fuel was cheap. Nevertheless, aircraft did not become the commonplace "aircabs" once forecast. The L-200, produced by the Czechoslovakian LET-factory in Kunovice, was based on the idea of producing a relatively inexpensive aircraft that could accommodate a pilot and up to four passengers. The first production run comprised a series of 10 aircraft equipped with Walter Minor 6-111 engines. As this configuration proved to be a bit marginal on power, a second series was built using the more powerful M-337 engine. These engines were used on many other designs in the former Eastern bloc countries, including the famous Zlin aircraft.

Although by no means a familiar sight in the western part of the globe, the bug-like Morava L-200 has been in use for decades; 367 of them were produced. About 30 percent stayed within the former Czechoslovakia, while the majority was exported to countries such as Russia, India, Australia and the region of Scandinavia.

The L-200 has stood the test of time, and many of them are still in regular use at small airports and flying clubs. The example shown here flies at the aerodrome of Vrchlabi in the Czech Republic. Its 2-blade airscrew identifies it as an early model. -4-

SPECIFICATIONS

Wingspan: 41 ft., 1 in.
Wing area: 173 sq.ft.
Height: 7 ft., 5 in.
Wing incidence: 2 degrees
Washout: -2 degrees
Airfoil section root: NACA 633 **A 417**
Airfoil section midwing: NACA 632 **A 415**
Airfoil section tip: NACA 631 A 412
Stabilizer incidence: -2 degrees
Takeoff weight: 4,258 lb.
Cruise speed @ 5,800 ft.: 195mph
Stall speed: 67mph
Range: 1,080 miles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MODEL AIRPLANE NEWS

HOW TO

Battery Basics

by Bob Aberle

How to choose a pack and treat it right

Whether you are a rank beginner or an RC pilot with glow fuel experience who has decided to try electric-powered flight, you need to know some facts about batteries and charging before you head out for that first "clean and quiet" flight. This article explains the basics of the batteries you will come into contact with and the techniques necessary to charge and maintain them.

BATTERIES

To get the maximum enjoyment out of electric-powered flight, you will need to use batteries intended for fast charging in the field. Ideally, you should be able to get 8- to 10-minute flights on a charge and be able to "fast" recharge the batteries in approximately 20 minutes. Using multiple battery packs, it is possible to fly almost continually; one pack can be in the plane while another is on the charger.

Batteries suitable for fast charging are available from companies such as Batteries America (also known as E.H. Yost & Co.), B&T R/C Products, TNR and others. The capacity of these cells is generally stated in milliamp hours (mAh); a battery rated at 1200mAh is capable of supplying 1200mA (or 1.2 amps) of current for one hour, after which it is fully depleted.

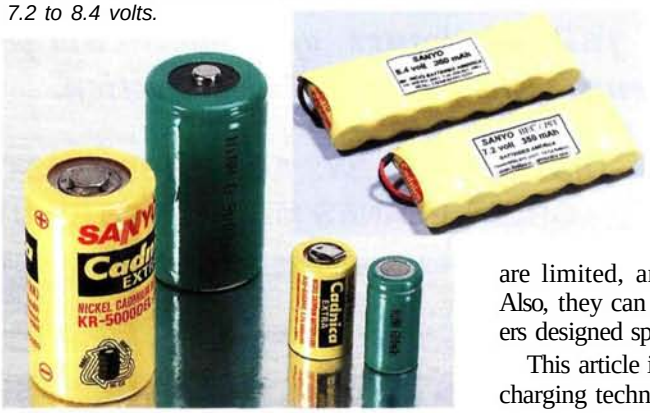
The most common battery type is the nickel-cadmium (Ni-Cd) pack. These are available with either fast-charge or overnight-charge-type cells. The fast-charge packs tend to power larger, electric-powered aircraft, while the overnight-charge cells are more commonly used in micro and parking-lot models, as well as in radio systems (receivers and transmitters). Capacities can range from as little as 50mAh all the way up to 5000mAh (5 amp hours). The specific capacity of a cell or a pack is usually stamped right on the product. If you can't find a marking, ask the manufacturer or distributor because you need to know the capacity to determine the proper charge current. Of course, the higher the capacity of the battery, the more it will weigh. Everything in electric-powered flight is a careful balance of motor power (wattage), battery capacity, battery voltage (determined by the number of cells in the pack) and weight. Get the correct balance, and you will obtain the longest flights with maneuverability that can rival glow-powered models.

A newer type of battery now becoming very popular is the nickel-metal-hydride (NiMH) pack. NiMH cells are somewhat lighter than Ni-Cd cells of comparable capacity but supply significantly less current than an equivalent Ni-Cd. Also, the fast-charge current has to be limited with NiMH cells; otherwise, battery life will be substantially shortened. But by respecting their limitations, you can end up with more capacity in a lighter battery.

An even newer type of battery is the lithium-metal variety, which has found favor in the new, upcoming world of indoor micro RC flight. Lithium-metal cells offer weight and capacity advantages over more conventional batteries, and they produce more than twice the voltage per cell, so fewer cells can be used. But at present, the size and capacity choices with lithium-metal cells are limited, and the cells are expensive. Also, they can only be charged with chargers designed specifically for that purpose.

This article is an overview of battery and charging techniques and is intended to get electric-flight newcomers up to speed. If you have any questions or comments on this or related topics, please feel free to write to me c/o *Model Airplane News*, 100 E. Ridge, Ridgefield, CT 06877-4606 USA.

Here are two battery packs that use the exact same 350mAh cells. The upper pack has 7 cells; the one below has only 6. As you can plainly see from the markings, adding or subtracting a cell does not affect a pack's capacity—both *are 350mAh. Adding a cell does, however, increase the voltage output from 7.2 to 8.4 volts.*



NiMH *cells (green) have a size/weight-to-capacity advantage over Ni-Cds (yellow). The large cells on the left are the same size, but the NiMH has nearly twice the capacity—9000mAh versus 5000. The small cells are both 600mAh, but the smaller diameter of the NiMH saves weight*

BATTERY CHARGING

To fully exploit the advantages of electric-powered flight, you will need a "peak-detect" battery charger. Basic chargers that operate simply from a timing device can easily cause over- or under-charging. The peak-detect charger senses when the battery pack reaches full capacity and shuts itself off automatically (some revert to a trickle or sustaining charge level). So do yourself a favor and invest in a peak-detect charger right from the start; prices begin at slightly more than $100. My favorite, because it is inexpensive, easy to operate and reliable, is the AstroFlight 110D. It can handle up to 18 Ni-Cd or NiMH cells at up to 5 amps charge current. It operates from your 12V car battery (or a battery of comparable size). Note: do not attempt to use your little 12V field kit (motorcycle-type) battery. It has only a fraction of the current capacity of a car battery, and the charge will be quickly depleted after only a few flights. With the diminishing capacity, the fast-charge period will take longer and longer, and this is frustrating.

All new Ni-Cd and NiMH batteries should initially be charged at the overnight rate. A 1 200mAh battery pack will need 120mA (1200 divided by 10) of charge current. My favorite overnight charger is the Ace R/C (now Ace Hobby Distributors) Digital Dual Vari-Charger (DDVC), which has two adjustable outputs from 0 to 500mA and operates from either a 12V DC source or from 115V AC household power. (For more details on this DDVC, see my review in the May 2000 issue of *Model Airplane News.)*

Proper care of transmitter and receiver batteries requires a good peak-detect overnight charger. This Digital Dual Vari-Charger (DDVC) from Ace R/C is a good choice.

CHARGE RATES

There are three basic types of battery charging rates: "fast," "overnight" and "trickle." The fast-charge rate can usually bring a battery up to full charge in less than 30 minutes. This fast rate is used at the flying field and allows you to make many flights during the course of a day. The fast-charge rate is generally between two and three times the battery capacity in mAh, depending on the type of battery. Batteries used for fast charging in the field are so specified by their manufacturers/distributors.

Overnight charge rate (also referred to as "slow" charge rate) is calculated by taking the battery capacity in mAh and dividing by 10. A full overnight charge may take from 10 to 24 hours to complete and helps to condition or equalize the various cells that make up a battery pack. Overnight is also the charge rate of choice when using standard battery cells.

Trickle-charge rate is a very low "maintenance"-level charge that's derived by dividing the battery capacity in mAh by 50. This charge rate can be left on the battery indefinitely. Trickle-charging is rarely done with drive-system power packs; it is more common for radio-system batteries.

SELECTING FAST CHARGE CURRENT

For Ni-Cd batteries, the fast-charge current should be determined by taking the rated capacity (in mAh or amp hours) and multiplying that by three (abbreviated as 3C). This 3C rate is probably the best all-around fast-charge rate for the beginner. Again, let's take a battery rated at 1200mAh (1.2 amp hours). When you multiply 1.2 amp hours by 3, you get 3.6 amps, so set your peak-detect charger for 3.6 amps. If the pack is fully depleted, it will take approximately 20 minutes to reach full charge.

Setting the fast charge rate is a very important step. Unless you own one of the very new, fully automatic battery chargers, you will have to choose the appropriate correct charge current. Set it too low, and it will take too long to charge your batteries. Set it too high, and you will seriously overheat your batteries and possibly ruin them. As you get more experienced, you will find that certain higher capacity Ni-Cd batteries can take more than the 3C fast-charge rate, but to begin with, it is better to be cautious.

NiMH batteries must be treated a little more conservatively. For these cells, you should use only twice the rated capacity, or 2C. A 1200mAh NiMH battery would be charged at 2.4 amps (1.2x2). To reach a full charge will take approximately 30 minutes.

The lithium-metal batteries are usually rated at 800mAh. Chargers for this type of cell are set at about 80mA current (although several use a higher rate) and will automatically cut off when the voltage under charge reaches 3.4 volts per cell. Generally, these specialty chargers can be set to charge one, two, or three lithium-metal cells. A good charger for this purpose is the Magellan, manufactured by Magellan Technologies Inc. (reviewed in the January 2000 issue of *RC MicroFlight).* Another excellent charger is the JMP, designed by J.M. Piednoire of France and sold by various European distributors, including Chris Stewart of RCS Technik in Great Britain. There are several other types of lithium batteries now on the market; some are rechargeable, some are not.

CHARGING ROUTINE

I generally overnight-charge my battery packs at the C/10 (capacity divided by 10) rate a day or two before I plan to go flying. When I get to the field, I make my first flight of the day on that overnight charge. That usually does not produce a strong flight, but it does help to condition the battery. After that, I fast-charge the batteries using the peak-detect charger; this produces stronger results for the remaining flights of the day. When I return home, I put the batteries on overnight charge before storing them, but some modelers store their packs discharged; neither method will harm the batteries.

MAINTENANCE TIPS

• **Partial charging.** When you fast-charge a battery pack on a peak-detect charger, the battery will be fully charged automatically; the full charge is what shuts the charger off. For overnight charging, the charger should be left on for at least 10 hours; longer won't hurt! Some modelers mistakenly believe that if only a small amount of charge is used up, then only a short recharge is necessary. This is definitely not the case. The battery's chemistry is designed to receive a full charge. Never partially charge a battery. This is especially true for RC system batteries.

• **Cooling your batteries.** If a battery is fast-charged at the proper current level on a peak-detect charger, it should not get more than moderately warm using the 2C and 3C charge rates. When powering a model in flight, however, current levels can average from 10 to 30 amps and can be as high as 50 amps or more on some specialty planes. At these high currents, the battery can build up substantial heat during a flight. Sometimes, it can even become too hot to handle! You must cool a battery pack down before you attempt to recharge it. If the pack is hot when you start charging, you can easily damage or even ruin it. A common mistake among modelers is to use ice or dry ice in a cooler to quickly reduce battery temperature, but this causes very uneven temperatures throughout the pack.

A good fast-charger is a must-have to get the most from electric-powered flight. This AstroFlight 112D is a slightly updated version of the author's ***favorite 110D.***

My solution, thanks to Ric Vaughn (an AMA/NEAC Electric Nationals first-place winner in 1999), is to use a RadioShack 12V electric fan (catalog no. 273-243) and insert it into one end of a 12-inch-long piece of 3-inch-diameter PVC tubing. This fan draws only about 100mA of power, so it can be connected all day to your car battery without a problem. You insert the hot battery pack into the open end of this tube and simply let the air from the fan flow over it. In about 5 minutes, the battery pack will be cool enough to charge. If you do this every time you recharge your battery packs, they should last a long time.

• **Cycling.** You'll hear the word "cycling" when it comes to RC system batteries. This refers to the technique of discharging a battery pack all the way down to its minimum charge (usually 1 volt per cell) then recharging it. Battery capacity can be measured (in mAh) during the discharge. This process is said to eliminate the "memory" effect, whereby the battery gets used to providing only a certain amount of its total capacity.

When used for electric-powered flight, a battery is taken down to practically minimum capacity every time. As such, you are essentially cycling these batteries every time, so nothing else needs to be done to them. You can, of course, discharge them once in a while to measure the effective capacity of a pack.

TYPICAL CHARGING CURRENTS	NI-CD Fast-charge current (3C) (20 minutes to full charge) in mA (amps)	NIMH Fast-charge current (2C) (30 minutes to full charge) in mA (amps)	NI-CD AND NIMH Overnight-charge current (C/10) (10 hours to full charge) in mA (amps)
50mAh	150	100	5
150mAh	450	300	15
300mAh	900 (0.9)	600 (0.6)	30
500mAh	1500(1.5)	1000(1)	50
600mAh	1800(1.8)	1200(1.2)	60
1000mAh	3000 (3)	2000 (2)	100
1300mAh	3900 (3.9)	2600 (2.6)	130
1600mAh	4800 (4.8)	3200 (3.2)	160
2000mAh	6000 (6)	4000 (4)	200
2400mAh	7200 (7.2)	4800 (4.8)	240
3000mAh	9000 (9)	6000 (6)	300
5000mAh	15000(15)	10000(10)	500 (0.5)

Ace ***Hobby Distributors*** *(formerly Ace R/C), 116 W. 19th St., Higginsville, MO 64037-0472; (800) 322-7121; (660)* **584-***7121; fax (660) 584-7766; tech support (660) 584-6723; acehobby&ctcis.net; www.acehobby.com.*

AstroFlight Inc., *13311 Beach Ave., Marina del Rey, CA 90292; (310) 821-6242; fax (310) 822-6637; www.astroflight.com.*

B&TR/C Products, *508 Lake Winds Trail, Rougemont, NC 27572; phone/fax (919) 471-2060.*

Batteries America, *aka* ***E.H. Yost*** *&* ***Co.,*** *2211 D Purview Rd., Middleton, WI 53562; (608) 831-3443; ehyost@midplains.net; www.batteriesamerica.com.*

Hangar *9; distributed by* ***Horizon Hobb Inc.,*** *4105 Fieklstone Rd., Champaign, IL 61822; (217) 355-9511; www.horiy.onhobby.com.*

Magellan Technologies Inc., *10783 Northhampton Dr., Fischer, IN 46038; (317) 841-3851; www.magtechinc.net; weaverr@iquest. net.*

RCS Technik, *22 Dartmouth Park Ave., London, England NWS 1jN; phone/fax 44-171 -267-9049; rcstechnik@scsnet.net; www.rcscale.co.uk.*

TNR Technical, *301 Central Park Dr., Sanford, FL 32771; (800) 346-0601; www.batterystore.com.*

SPORT SCALE
STINSON L-5

A Speed 400 Sentinel observation plane

by Roy Day

When our flying field wasn't available for a few months, I decided to build a model I could fly in a park or a small field. I set out to design a plane near the upper size limit for the popular Graupner geared Speed 400 electric motor. I wanted the model to have good flying characteristics, so with a wingspan of 52 inches and a wing area of 440 square inches, its flying weight could not exceed 24 ounces. This flying weight is possible, but achieving it takes careful weight saving during construction.

The L-5 is built with common "truss" stick construction using mostly 1/8-inch-square, medium hard balsa. I also used 1/16- and 1/32-inch contest grade balsa sheet. My completed L-5 has an all-up flying weight of 22 ounces—a full 2 ounces less than my goal. At this weight, the 2.3:1 gear-reduction Speed 400 and 8, 600AE cells power the model very well.

Even as a sport scale the **L-5** *is recognizable with its large vertical tail and its swayback fuselage.*

Flying the L-5 offers relaxation and a lot of fun.

PHOTOS BY JIM HAWKINS AND ROY DAY

Prop: 9x5 SimProp

Battery: 8, 600mAh AE cells

Speed control: FMA SC-20 with BEC

Receiver: FMA micro 2000 FM

Servos: FMA S-80

SPECIFICATIONS

Name: sport-scale Stinson L-5

Type: 3-channel Speed 400 electric

Winqspan: 52 in.

Length: 38 in.

Wing area: 440 **sq. in.**

Weight: 22 oz.

Wing loading: 7.2 oz./sq. ft.

Airfoil: 12-percent thick, modified flat bottom

Motor: 6V, 2.33:1 geared Speed 400

Comments: the Stinson L-5 is easy to build and fun to fly; powered by a geared Speed 400, the model has a very light wing loading. Typical truss-stick construction throughout, and laminated parts are used for the wingtips and the vertical tail. It is ideal for flying **at** parks or in schoolyards.

FLIGHT PERFORMANCE **The Stinson L-5 is relaxing to fly. I usually fly it in small fields or at a** park, so I often hand-launch it, but it can take off from a smooth surface. It's so stable that I can easily hand-launch it without assistance. With a freshly charged 600mAh battery pack, 5-minute flights are typical. With its super-low wing loading, the model just floats in for landings.

Aerobatics? How about a loop after a dive to pick up speed or a wingover (sorta). No, the L-5 is not an airplane for aerobatics—just for fun flying.

CONSTRUCTION

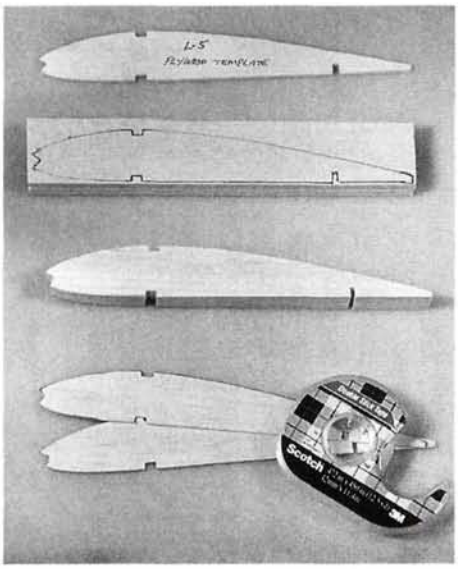
• **Wing.** Cut out the ribs with a scroll saw. You can make six to eight ribs at a time by stacking and joining 1/16-inch sheet balsa blanks with double-sided **tape and then drawing the rib** outline on the top piece. Then sand the pack of ribs to their final shape, and cut the spar notches before you remove the ribs from the stack. The ribs have a flat bottom from the TE to the front spar, so you can glue them right over the plan without any alignment jigs. Make the wingtip bows (and the outline of the vertical tail, if you like,) from laminated 1/16x3/8-inch balsa strips. To laminate these parts, I used 3/16-inch-thick foamboard forms to hold the layers in the correct shape while the glue dried. Hold the strips in place with pins or tape until the glue has dried, then lightly sand away any excess glue buildup. Now you are ready to assemble the wing over the plan.

The L-5 can be disassembled easily and packed in a box for vacation flying.

Build the wing center section and glue the dihedral braces into place.

Then build the right and left panels over the plan and install the vertical-grain-balsa shear webbing. Block up both panels to the correct dihedral angle, and glue them to the dihedral braces and to the center section. When the glue has dried, add the top sheeting. Notice that the top LE sheeting extends out only two rib bays. That is all you need for adequate wing strength and minimum weight. You can extend the sheeting all the way to the tip if you desire, but it will increase weight. Now remove the wing from the building board, and make the wing-attachment "grabber" out of laminated ply and balsa. Then, before you add the bottom sheeting, glue it to the front of the forward spar. Be sure to also add the ply TE reinforcement pad for the nylon hold-down bolts. Put the wing aside and begin the fuselage.

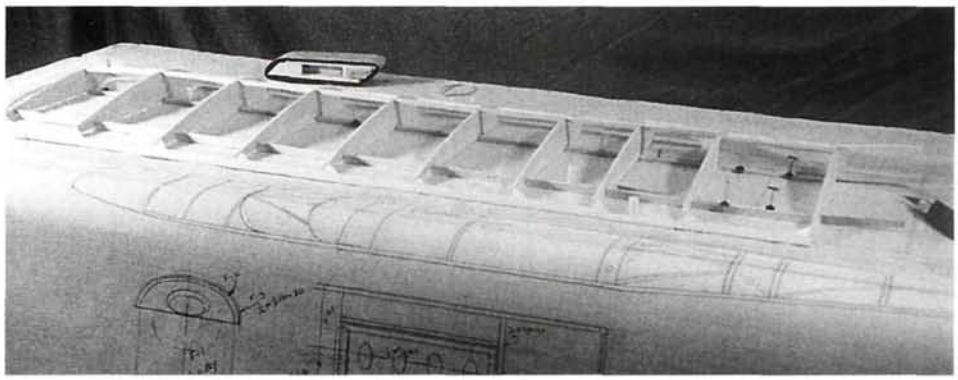
• Fuselage. First, laminate four longerons made of 1/16x1/8-inch balsa sticks and build the fuselage side directly over the wax paper or plastic plan cover. When the

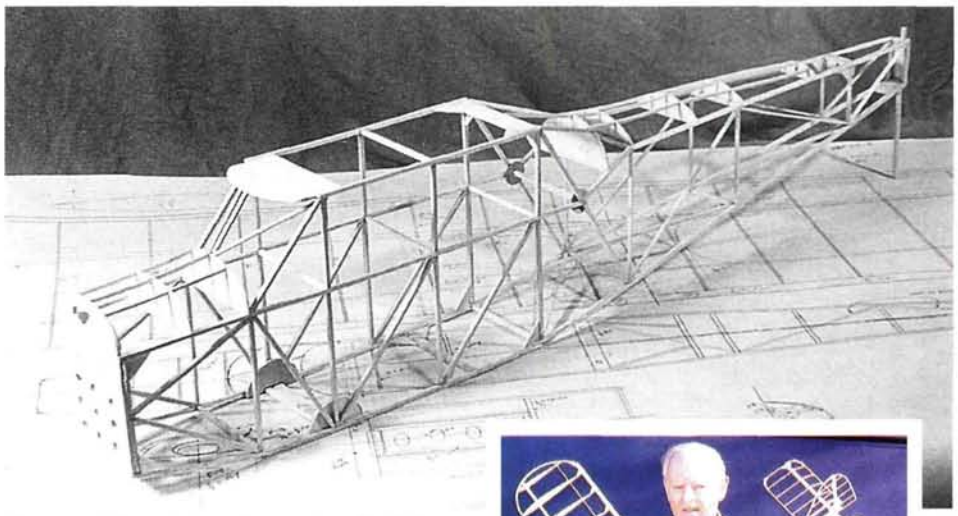


Use double-sided tape to stick six rib blanks together, and then cut them out with your scroll saw or band saw. Sand them to their final shape and cut the spar notches.

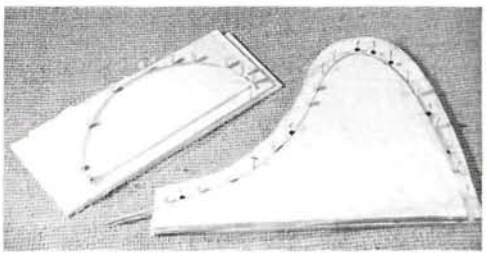
glue has dried, remove the sides from the board and assemble them over the plan top view. To produce a straight fuselage, be sure to keep the sides vertical and the tail post aligned with the centerline. The formers that support the aft 1/16x1/8 stringers are made of 1/16-inch-thick balsa. For extra strength, add thin 1/64-inch plywood gussets where shown on the plan.

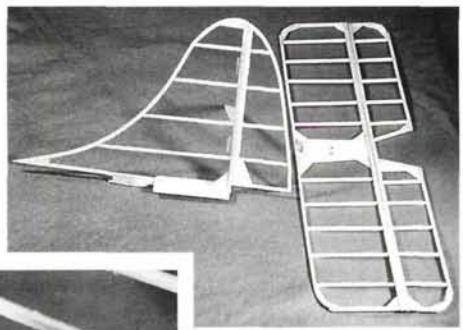
Glue into place the 1/8-inch lite-ply landing-gear support plate. The torsional gear arrangement can be removed easily if it is bent out of shape. Add lite-ply supports to the top of the cabin for the wing

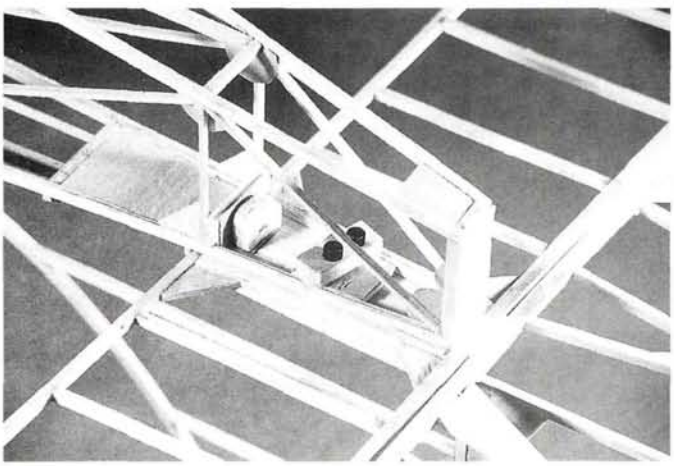




Top: Build the wing center-section first; then build the two wing panels and assemble them right over the plan. • Above: the fuselage is of typical truss construction—strong but light. For maximum strength, use gussets generously. • Right: the author holds the bare-bones L-S. Strict attention to weight is necessary to ensure the success of this Speed 400 plane. • Below left: the wing bows and vertical-tail outline are easily laminated using foamboard forms.





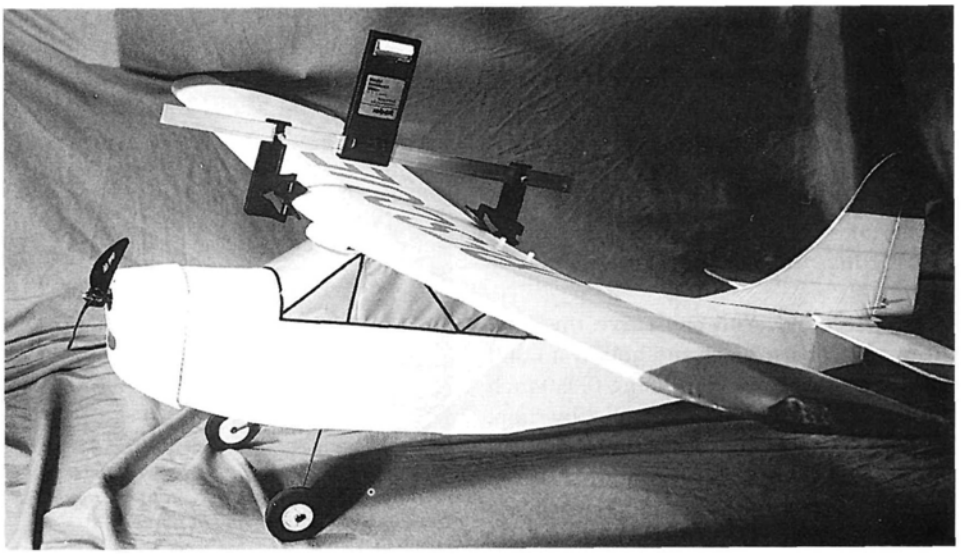


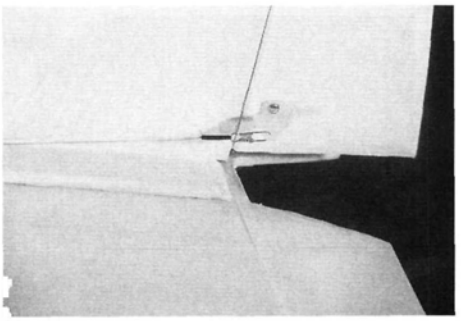
Above: the vertical and horizontal tail are bolted to the fuselage to allow easy disassembly.

Left: the tail is attached to the fuselage with two small nylon bolts that may be reached through an opening in the bottom of the fuselage.

grabber's alignment peg and the two aft hold-down bolts. To make battery changes easy, 1 added a removable hatch to the fuselage's bottom. Instead of a hinge, simple plywood tongues and a single screw hold it in place. The hatch opening also allows access to the interior so you can install the motor, speed control, servos, etc. After you have installed the components, including the pushrods, sheet the remaining areas of the fuselage as shown on the plan.

• **Tail feathers. I** designed the plane so that it can be disassembled easily and transported in a box. This means that both the vertical tail and the horizontal tail had to be removable. The plans show the 1/8-inch dowels and the 6-32 nylon attachment bolts and alignment blocks that attach the tail surfaces. The bolts are accessible through the opening in the tail's bottom, which also allows cooling air to escape. Of course, if you don't want this feature, you can simply glue the tail surfaces into place as usual. Begin the vertical tail by pinning down the laminated outline piece over the plan. Add the cross-member ribs to complete both the fin and the rudder. For stiffness, glue 1/64-inch ply strips to the fin's TE and the rudder's LE. Cut the rudder and fin apart, and add the fin keel block. Sand the fin and rudder outline to a rounded





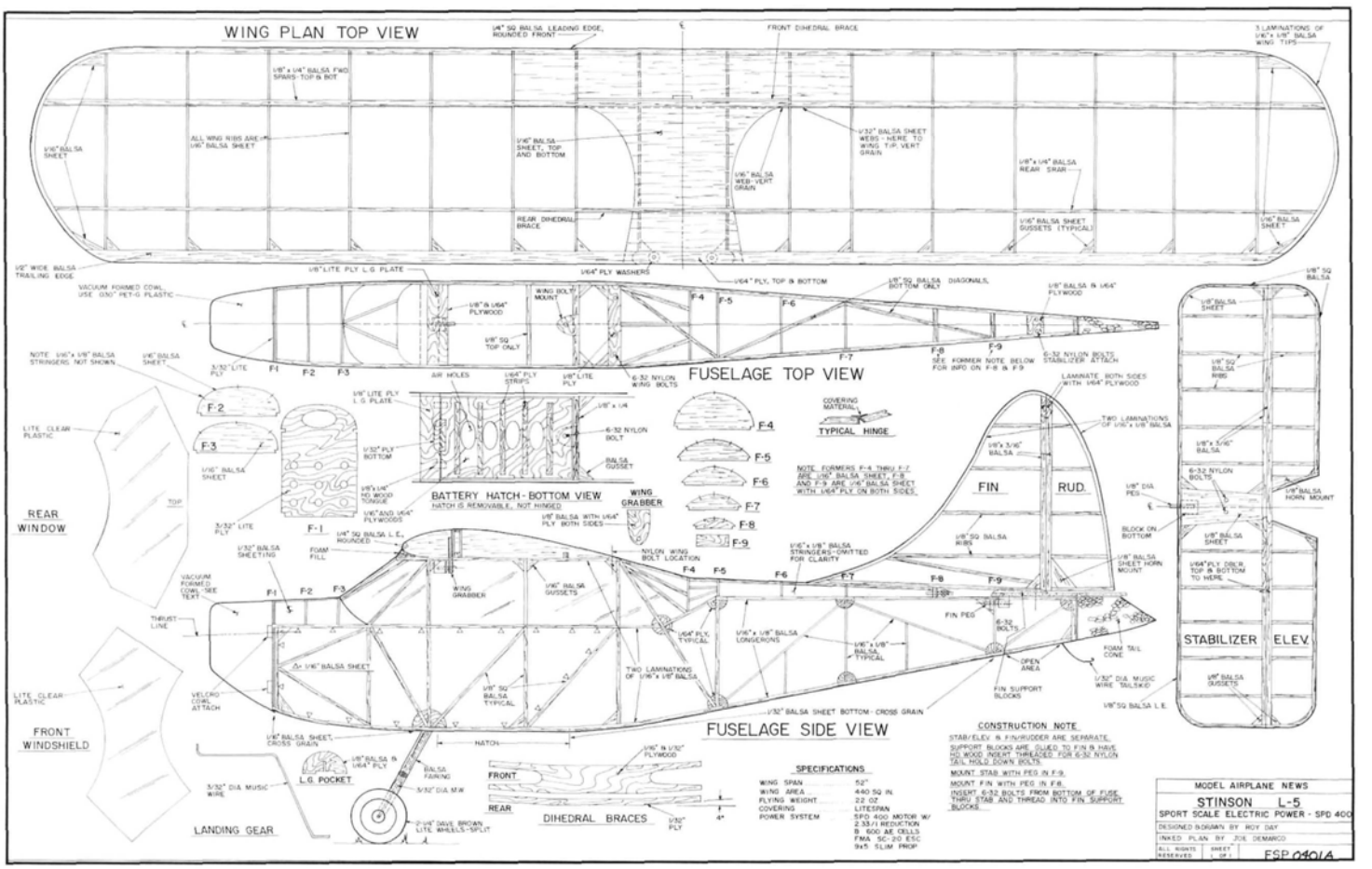
Above: the light wing structure can be twisted by the covering before the first flight, so before the first flight, check for wing twist with an incidence meter. • Left: a pull/pull system actuates the rudder using a light, low-stretch fishing line called Spiderwire.

To order the full-size plan, turn to "RCStore" on page 154.

Stinson L-5 FSPO401A

The Stinson L-5 geared Speed 400-powered model with a very light wing loading is easy to build and fun to fly. Typical balsa stick construction is used throughout, and laminated parts are used for the wingtips and the vertical tail. It is ideal for flying at parks and in schoolyards.

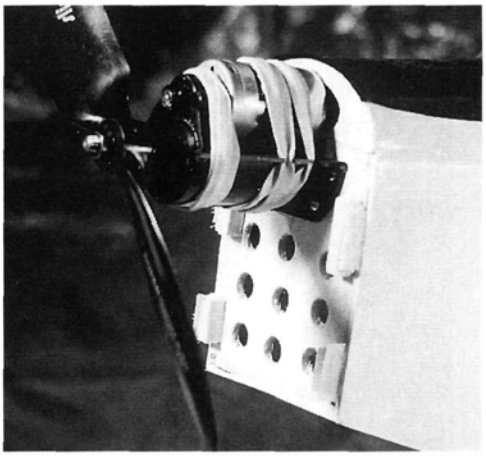
Span: 52 in.; length: 38 in.; power: geared Speed 400; 1 sheet; LD 2. $14.95



shape, and put them aside while you build the horizontal tail.

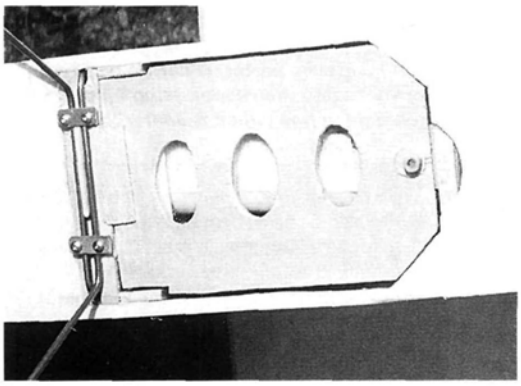
The horizontal tail is a straightforward stick construction and is built over the plan. Sand all the edges to a rounded shape, and taper the elevator's LE so it can be hinged at the top. I used the covering material as a hinge (see details on the plan). Hinge the rudder in the same way.

• **Engine cowl.** You can carve the cowl from a light balsa block and hollow it out. I vacuum-formed my cowl using 0.030-inch PET-G (Vivak) plastic from the hobby shop. I shaped the forming plug from **pink** foam that I had covered with a couple of 1/8-inch-thick layers of Bondo auto-body filler. The Bondo protects the foam from the heat during the forming process. Sand the Bondo to a smooth finish, and you're ready to vacuum-form. I used hook-and-loop fastener to attach the cowl to the fuselage. This allows quick and easy motor servicing.

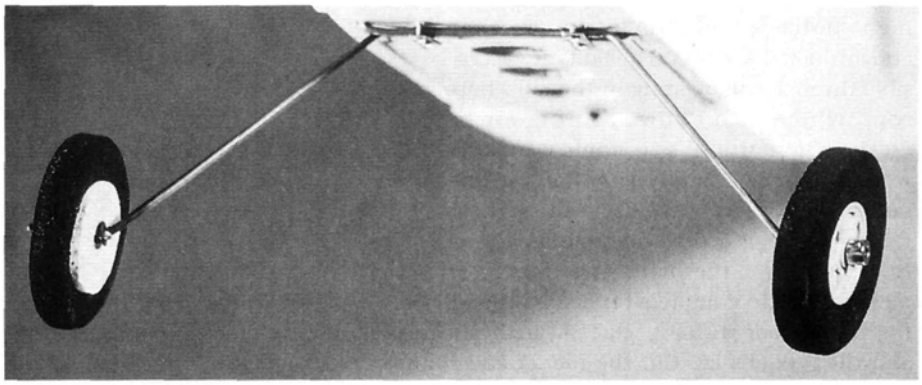


A Speed 400 motor with a 2.3:1 gear drive furnishes plenty of power. Rubber bands hold the geared motor firmly in place.

The cowl is vacuum-formed of 0.030-inch plastic and is held in place with hook-and-loop fastener. You can also make a cowl by carving a balsa block.

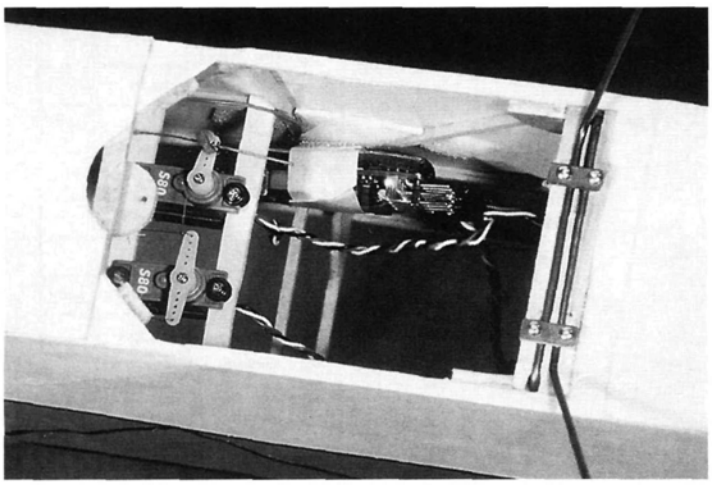


A removable hatch in the fuselage bottom allows easy access to the battery.



Make light wheels by sawing in half a standard Dave Brown foam wheel. To stiffen the wheel, add a disc of lite-ply to the cut side.

• **Landing gear.** The landing gear is made of 3/32-inch diameter-music wire that is held in place with thin brass strips and no. 2 screws. I made the wheels by vertically slicing a light foam wheel in half. I then added a piece of lite-ply to the inner surface as a hub, and I sanded the tires round for a better look.



There's plenty of room for the FMA micro 2000 receiver and two FMA microservos above the battery pack.

FINAL ASSEMBLY

I made the rudder pull/pull cables with 12-pound-test Spiderwire—a low-stretch fishing line. The end connections are made of heat-shrink tubing and a drop of CA glue to secure the knot. The elevator is controlled by a Sullivan no. 507 flexible Gold-N-Rod cable. Be sure to support the cable housing in the fuselage. I installed the elevator and rudder servos on hardwood rails positioned just aft of the battery and receiver.

The covering is Balsa Products Litespan applied with Balsaloc adhesive. I put one coat of dope on the Litespan. The color scheme roughly follows the U.S. Air Force L-5 rescue-plane markings.

I hope you enjoy building and flying the L-5 as much as I did. Take it out to the park on a quiet afternoon and have a relaxed flight or two. You'll love the way the L-5 flies.

Balsa Products Engineering, *122)'amen Ave., Iselin,* NJ *08830-2601; (732) 634-6131; www.balsapr.coin.*
Dave *Brown* ***Products,*** *4560 Layhigh Rd., Hamilton, OH 45013; (513) 738-1576; fax (513) 738-0152; www.dbproducts.com.*
FMA Direct, *9607 Dr. Perry Rd., Unit 109, Ijamsville, MD 21754; (800) 343-2934; fax (301) 831-8987; www.finadirect.com.*
Graupner; *distributed by* ***Hobby Lobby Intl.,*** *5614 Franklin Pike Cir., Brentwood, TN 37027; (615) 373-1444; fax (615) 377-6948; www.hobby-lobby.com.*
Sullivan Products, *One North Haven St., Baltimore, MD 21224; (410) 732-3500; fax (410) 327-7443; www.sullivanproducts.com.*

MODEL AIRPLANE NEWS
PRODUCT
REVIEW

Multi-function magic

GRAND WING SERVO

6- and 8-channel

Receivers

by Bob Aberle

Grand Wing Servo (GWS) recently added a new series of RC aftermarket receivers to its growing product line. Response to the GWR-4P 4-channel receiver (reviewed in the November 2000 issue of *Model Airplane News)* has been very favorable, and GWS has now expanded the number of available frequencies to 45. The 6- and 8-channel offerings from GWS (the GWR-6N and the GWRD-8) are every bit as good. As with the R-4P, these new receivers are distributed by Balsa Products Engineering, and they are compatible with almost any brand of transmitter now on the market. Also, like their 4-channel sibling, these new units are a real bargain.

6-CHANNEL RX

The GWR-6N receiver is a 6-channel version of the tiny GWR-4P, but its connectors have been placed on the end of the case rather than on the top. This is especially handy when installing the receiver inside very narrow fuselages such as those of small sailplanes. Its receiver circuitry is single conversion, just like that of the R-4P. There is no FM shift selection feature (no switch!), so you must purchase the R-6N specific to your transmitter. Receivers stamped with an "F" are suitable for use with Futaba and Hitec transmitters; a *"]"* indicates that it's compatible with JR or Airtronics/Sanwa transmitters. Like the R-4P, the R-6N is available in 45 channels ranging from 15 to 60. The GWS receivers do not incorporate a built-in fail-safe for signal interference, as many new receivers now do, but I feel more comfortable without it since the plane's behavior is more predictable during signal interruptions.

As you might expect, the R-6N is slightly larger than the R-4P; it measures 1 1/2 inches long (including the connector pins), 13/16 inch wide and $^{7/1}6$ inch high *(1/2* inch high measured to the top of the crystal). Including its 39-inch-long antenna, it weighs 0.3 ounce (approximately 9 grams). The connector pins will accept most popular RC connectors, with the center pin (of three) being battery-positive. The pin farthest away from the PC board is the signal pin. If you use the older style Airtronics/Sanwa connectors, be sure to use an Airtronics-provided adapter or the new Airtronics Z-type connectors to compensate for the reversed pin polarity.

The R-6N receiver performed at least as well as the R-4P in every respect. Its range was more than 1,000 feet with the transmitter antenna fully extended and the full 39 inches of receiver antenna. I ran out of test space before it ran out of range. For outdoor application, be sure to use the full receiver antenna length. During the test, 1 deliberately subjected the R-6N to adjacent channel signal hits only 20kHz away, but 1 didn't notice any interference.

Since this receiver is so similar to the micro R-4P, the deciding factors are its weight and the number of channel functions you need. If you are flying an indooi electric model with a rudder, an elevator and a motor control, the R-4P is the best choice. If you fly models that need extra control features, such as spoilers, flaps, of even two separate motor controls, the extra two channels of the R-6N make that possible. The difference in weight is only 0.1 ounce.

8-CHANNEL RX

The new RD-8 is more of a conventiona receiver than a micro. It is still small and light, plus it is dual conversion, has eigh channel functions and is FM shift-selec table. It is 1 11/16 inches long, 1 1/4 inches wi and 3/4 inch thick (including a slight project

SPECIFICATIONS

MODEL	GWR-6N receiver	GWRD-8 receiver
Weight	0.3 ounce (approx. 9g)	0.78 ounce (approx. 22g)
Dimensions	$1^{1}/2x^{13}/16X^{7}/16$in. (without the crystal)	$1^{11/1}6x1^{1}/4X^{3}/4$in. (includes the crystal)
No. of channels	6	8
Frequency band	72MHz	72MHz
Modulation	FM (specific to TX)	FM (switch-selectable for high or low deviation)
Conversion type	Single	Dual
Street price:	$32 (including the crystal)	$60 (including the crystal)

Comments: excellent multi-channel receivers, exhibiting good range, selectivity and sensitivity. Their light weight and attractive price make both the 6- and 8-channel versions great buys.

GWS RECEIVERS

tion of the crystal). It weighs 0.78 ounce (approximately 22 grams) with its 39-inch antenna. Conventional RC connectors will plug into this receiver. As with the R-6N, the older Airtronics/Sanwa connectors require an adapter. On the RD-8, the outermost connector pin is battery-negative. The middle pin is battery-positive, and the third pin (closest to the label) is the signal.

On the rear of the case is a tiny but easily accessible switch that lets you select the proper FM deviation for your transmitter. Moving the switch to its upper position (toward the edge of the case) allows you to use either JR or Airtronics transmitters; the other switch position is for Futaba or Hitec transmitters. The RD-8 is initially available in the following ten channels: 17 through 21 and 50 through 54. The R-4P was first offered in the same range, but the choices for it have since been expanded, so more options may be on the horizon for the RD-8 as well.

Electronic testing has shown the RD-8 to have excellent range, sensitivity and selectivity. My friend and fellow member of the AMA RC Frequency Commitee, George Steiner, tested the third order intercept point (3OIP) of this receiver at +8 decibels, which is incredibly good. The RD-8 should operate in any field environment without problems, and even though it's small, it's capable of flying large models without difficulty.

As of this writing, Balsa Products Engineering has the RD-8 in stock, and they expect to have the R-6N by the time you read this. Considering their capabilities, you'll be pleasantly surprised at the units' low prices. The RD-8 costs $60, and though the price of the R-6N hasn't been finalized yet, Bob Peru of Balsa Products estimates a street price of about $32. If you're in the market for a lightweight, affordable, long-range, 6- or 8-channel receiver for your next airplane project, these two from GWS fit the bill nicely.

Airtronics, 1185 Stanford Ct., Anaheim, CA 92805; (714) 978-1895; fax (714) 978-1540; ***www.aiitronics.net.***
Balsa Products Engineering, *122 Jansen Ave., Iselin, Nl 08830-2601; (732) 634-6131; www.bahapr.com.*
Futaba Corp. of America, *exclusively distributed by Great Planes Model Distributors Co., P.O. Box 9021, Champaign, IL 61826; www.fiitaba-rc.cotn.*
Grand Wing Servos (GWS); *distributed by Balsa Prodi ids Ei lgineerh ig.*
Hitec RCD ***Inc.,*** *12115 Paine St., Poway, CA 92064; (858) 748-6948; fax (858) 748-1767, www.hitec.com*
JR, 4105 Fieldstone Ril., Champaign, IL 61822 (217) 355-9511; www.horizonhobby.coni. 4-

Easy to Make Wing Fillets

Add strength and detail to your scale plane

by Dave Garwood

A feature that enhances both the function and the appearance of a scale airplane is appealing to all model builders. It offers the best of both worlds. Wing fillets are a perfect example; they increase the strength of the joint between the wing and the fuselage, and they make any model whose full-size counterpart featured wing fillets look much more authentic. When you add an easy, inexpensive technique for creating strong, great-looking fillets like the one featured here, you have a recipe for success with any scale project.

Bondo, or any brand of polyester automotive body dent-filler, is excellent as fillet material for three reasons. It's easy to apply and sands well to make close-fitting and good-looking joints. Its adhesive properties add strength to the joint between wing and fuselage. It's inexpensive; a small can will be enough to make fillets for many models. Brian Laird taught me this method, and he recommends it for his Slope Scale PSS warbird sailplanes and slope jet models.

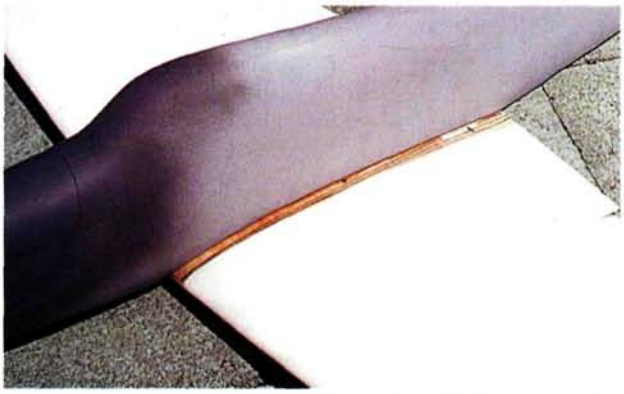
HELPFUL HINTS

- Auto-body filler might be too heavy for your model. If that's the case, this technique works equally well with Carl Goldberg Model Magic filler or drywall spackle from the hardware store. Each application of these materials must dry fully before it's sanded, but they are lighter and easier to sand than auto-body filler.
- On some airplanes, the rear of the fillet curves from the trailing edge of the wing to the fuselage. To replicate this on a model, fit a small piece of plywood to the trailing edge and cover it with the filler.
- I have seen this technique applied to models with removable wings. In this case, cover either the wing or the fuselage with thin plastic sheeting and apply the filler material. The plastic will be released from the cured filler material and will allow the wing and fuselage to be separated.

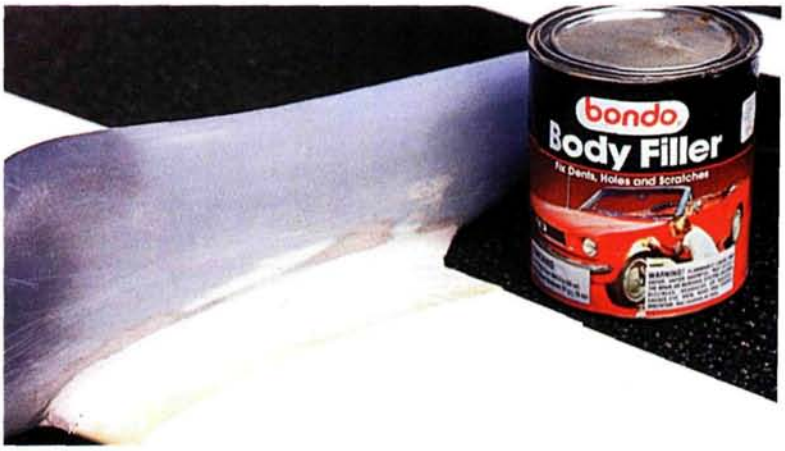
WHAT TO DO

After you've covered your wing and fitted it to the fuselage, apply two layers of masking tape at the edges of the area where the fillet will go on the wing. This allows you to sand at the outside feathered edge while it protects the wing covering from being damaged by your sanding block. Mix a batch of auto body filler according to the manufacturer's instructions, and apply it to the wing joint with a round stick, (Popsicle sticks or tongue depressors are ideal, depending on the radius of the fillet you want).

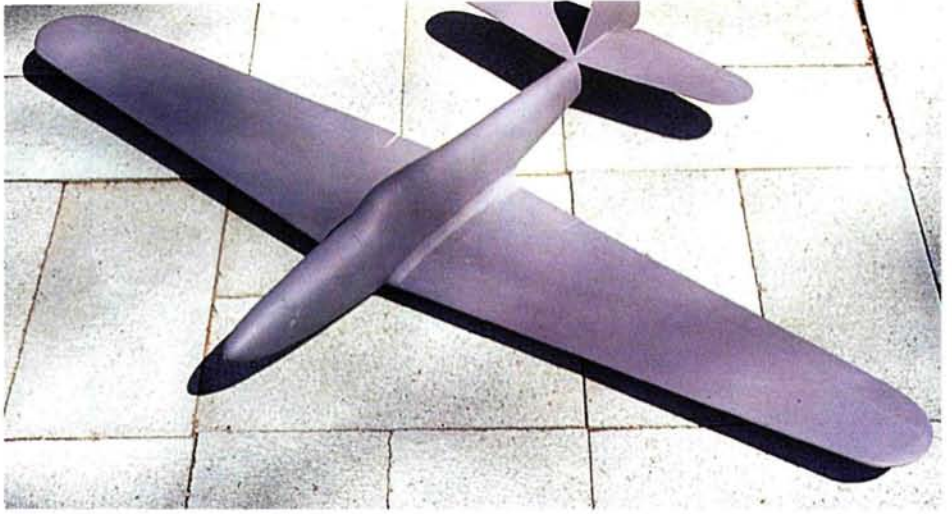
As the body filler begins to harden, quickly sand the fillet roughly to shape with coarse sandpaper wrapped around a dowel of a suitable diameter. The body filler will harden rapidly, so a timely rough-sanding now will save you work later. Apply filler and sand as many times as necessary to build up the fillet to the thickness and shape you want. If you're an accurate sculptor, you may need only one or



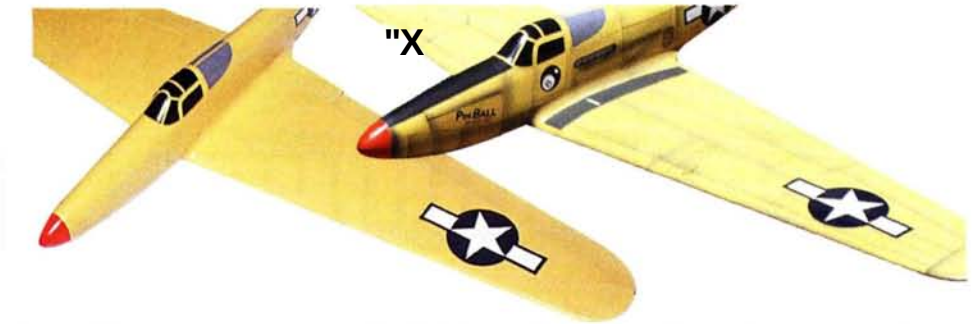
The author's Slope Scale P-63 Kingcobra with the wing and fuselage joined with epoxy. Notice the ugly gap where the two parts meet.



Three layers of auto-body filler (sand each layer) greatly improve the look and strength of the wing-to- fuse joint. Note the curve at the trailing edge where the wing meets the fuselage; a piece of plywood under the body filler adds support.



Once the *fillet has been properly contoured, the plane can be sanded and primed as usual.*



Left: *with the color coat laid down, the fillet is seamless, just as if it was in the model's original design. Right: panel lines and airbrush weathering give the P-63 an authentic scale look. Can you imagine detailing a plane to this degree without adding wing fillets?*

two applications; if you're less practiced with auto-body filler, you may be happier with the fine control offered by building the fillet up with three, four, or five layers.

After the layers have been applied and rough-sanded, let the material cure fully and then do your final sanding with successively finer grades of sandpaper. Wet-and-dry sandpaper lasts longer when you dip it into water to clear off the sanding dust.

This technique really is as easy as it sounds, and the result looks great. The materials are all readily available and very inexpensive, so you can experiment a little while you get the hang of working with the auto-body filler. On your first try, build the fillet up in layers; this takes only slightly longer. Try adding fillets to your next scale project; this technique can really improve the look and function of your model.

CGM (Carl Goldberg Models), 4734 W. Chicago Ave., Chicago, IL 60651; (312) 626-9550; fax (312) 626-9566.
Slope Scale; 12935 Lasselle St., Moreno Valley, CA 92553; (909) 924-8409; http://ourworlil .CompuServe.com/liomepages/slope_scale.

The finished Kingcobra looks great over Lake Ontario.

PRODUCT WATCH

Latest product releases

AT *MODEL AIRPLANE NEWS,* we not only **tell you what's new, but we also try it out first to bring you mini-reviews of the stuff we like best. We're constantly being sent the latest support equipment manufacturers have to offer. If we think** a **product is good—something special that will make your modeling experiences a little easier or just plain more fun—we'll let you know here. From retracts and hinges to glow starters and videotapes, look for it in "Product Watch."**

DYMOND MODELSPORT USA

Xing Mini Charger

All charged up!

This small, peak-detect (auto cutoff) fast charger is capable of handling from 4- to 7-cell Ni-Cd packs at selectable current levels of 1, 2 and 4 amps. It comes in a red-anodized, extruded-aluminum case that's only 4 inches long. Input power (12 volts DC) is applied via a pair of 16-inch wires that end in alligator clips. This input is reverse-polarity protected and contains a 10A fuse for added protection (accessible from the outside of the case). The output consists of a small terminal block with screw contacts. A 3[1]/2-inch cable that ends in a Tamiya connector is also provided, but any popular connector could easily be substituted.

When power is first applied to the Xing (say "zing"), a yellow LED indicates that power is on. Then you connect a 4- to 7-cell battery pack, and the middle LED glows green (in addition to the yellow LED). At this point, you select your charge current of 1, 2, or 4 amps. The final step is to press the start button, at which time the third LED glows red. The battery pack is now on fast charge (all three LEDs continue to glow).

When the peak-charge current is reached, the Xing automatically shuts down (the red LED goes out), and the unit reverts to a pulsed trickle-level charge (the yellow and green LEDs continue to glow). I measured the average trickle current at about 200mA when using the 1A charge rate, about 250mA for the 2A rate and close to 300mA when charging at the 4A level. At those rates, I wouldn't leave the packs on the charger for a long time; just use it to keep your pack topped off at the field while **you** get ready for your next flight.

You do need to use the slide switch to select the right charge current for your particular battery capacity. Failure to choose the correct current could lead to over- or under-charging. The instructions supplied are not very informative on this subject, but a small chart on the outside of the shipping box suggests that 600 to 1,000mAh Ni-Cd batteries should be charged at 1 amp, 1,300mAh cells at 2 amps and 1,700mAh cells at 4 amps. Battery packs with capacities between these values will need a little more or less time to charge but are nothing to worry about. I also recommend charging packs as small as 275mAh on the 1A rate, since this would equate to only a 3C rate. Keep in mind that it usually takes about 20 minutes to fully charge a completely discharged battery at the 3C rate. I noticed that even at the 1A charge rate, the Xing did get quite hot to the touch; be sure to allow air to flow around it while it's in use to help dissipate some of the heat it generates.

The instructions also make it clear that RC system receiver packs (usually 4 or 5 cells) should be charged only at the 1A level because many of these packs employ relatively lightweight wiring, and placing more than 1 amp on this fine wire might actually melt it.

All in all, this little charger worked reliably every time. Although somewhat limited by its ability to charge only 4 to 7 cells, at the list price of $39.95, it's a bargain. Small enough to easily tuck away in a field kit, this is one very neat little product! *—Bob Aberle*

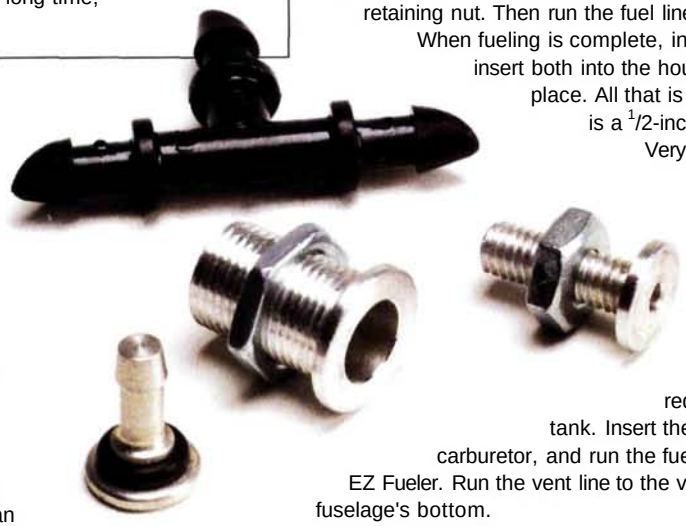
Dymond Modelsport USA Ltd., 683 N. Main St., Oshkosh, Wl 54901; (920) 303-1100; fax (920) 303-2021; www.rc-dymond.com.

J'TEC

EZ Fueler Fuel Dots

Hot dots

On a plane equipped with a fuel tank, it's important to have access to the tank so you can fill it. If the fuel-inlet nipple is readily accessible, you can simply disconnect the fuel line from the engine and fill the tank through it. If the inlet is not accessible, as on many cowled engines, some other provision must be made. A number of different types of fuelers are on the market, but their reliability and complexity vary greatly. The simplest arrangement I've found is to install a third line on the fuel tank and bring it outside of the fuselage through an EZ Fueler fuel dot. With this arrangement, the pick-up line goes to the engine, the vent line gets connected to the pressure fitting on the muffler, and the third line, used for filling, goes to the EZ Fueler. The EZ Fueler consists of an aluminum housing with a retaining nut and an aluminum plug with an O-ring. The housing is installed in the fuse's side through a [3]/8-inch hole and is fastened in place by the retaining nut. Then run the fuel line through the housing for fueling. When fueling is complete, insert the plug in the fuel line and insert both into the housing. The O-ring holds both in place. All that is visible on the outside of the fuse is a [1]/2-inch-diameter aluminum dot. Very neat!



J'Tec also sells an EZ Fueler Combo that includes an EZ Fueler, an aluminum vent fitting and a T-fitting. The combo is intended for use with gasoline engines that have a diaphragm-type carburetor. This setup requires only two lines on the fuel tank. Insert the T-fitting in the line going to the carburetor, and run the fueling line from the T-fitting to the EZ Fueler. Run the vent line to the vent fitting installed in the fuselage's bottom.

The EZ Fueler costs $7.99; the Combo costs $13.95. This system is easy to install, looks neat and works great. *—Jim Onorato*

J'Tec, 164 School St., Daly City, CA 94014; (650) 756-3400; www.jtec.com.

by Chris Chianelli

SaitoFA-180

The battle for the biggest single-cylinder 4-stroke engine started when, quite a few years ago, Saito increased the displacement of its 1.20 to 1.50 cubic inches (ci). More recently, Enya answered the call by increasing *its* R1.20 to 1.55ci and designating the engine as the R1.55 (see "Air Power," June 2000 issue of *Model Airplane News).* In both of these cases, the larger displacement version uses the earlier, smaller engine's crankcase and will fit the mounting-bolt pattern of the smaller, original engine. Now, Saito has upped the ante again with the FA-180; it also fits the bolt pattern of the 1.20, and it has the same mounting-bolt-to-thrust-washer dimension, so it can be bolted directly into any model that had a Saito 1.20 (or 1.50) in it, and it will also fit almost any model designed for a 1.20 4-stroke.

THE PROGENITOR

The bore and stroke of the Saito 1.20 and 1.80 are 32x24.8mm and 36x28.6mm, respectively. Considering that the 1.80 has 50 percent more displacement than its progenitor, and that its piston, which is 4mm larger in diameter and, therefore, heavier than the 1.20's piston, you might think the 1.80 would vibrate more than its two smaller brothers, but it really doesn't. Yes; the 1.80 does vibrate more than both the 1.20 and the 1.50, but vibration levels throughout testing can be characterized as moderate at worst.

The one-piece muffler is internally baffled to help soften the bark of this power monster. The pressure fitting comes installed.

CARBURETION

Except for a lmm increase in venturi size compared with the 1.50's, the carburetor is a time-proven, 2-needle design that has been used on both the 1.20 and the 1.50, with one obvious exception. The manual choke has been removed, and this, in my opinion, was a good thing to do. If you're not very careful, using a choke on these large, single-cylinder 4-strokes can easily cause dramatic flooding to the point of combustion chamber hydra-lock. I've been removing these manual units for years now because they are simply not needed. I start all my 4-strokes the same way: with the throttle closed down to the high-idle position, I spin the prop with a strong electric starter—with the glow-plug battery disconnected, of course—for a

SPECIFICATIONS

Engine: Saito FA-180

Distributor: Horizon Hobby Distributors

Warranty: 3 years

Displacement: 1.80ci

Horsepower: 2.8 on 30 percent nitro (rpm not given)

Bore: 36mm

Stroke: 28.6mm

Piston/sleeve: AAC (aluminum piston w/ring; chrome-plated aluminum cylinder)

Suggested rpm range: 2,000 to 10,500

Weight: 31 oz.

Width: 2.7 in.

Length: 5.43 in. (from thrust washer to rear carb body)

Shaft diameter: 10mm

Hits
- Great horsepower and torque.
- Good handling characteristics.
- Excellent power-to-weight ratio, craftsmanship and metallurgy—tools included.

Misses
- None (and I really tried to find one!).

PERFORMANCE

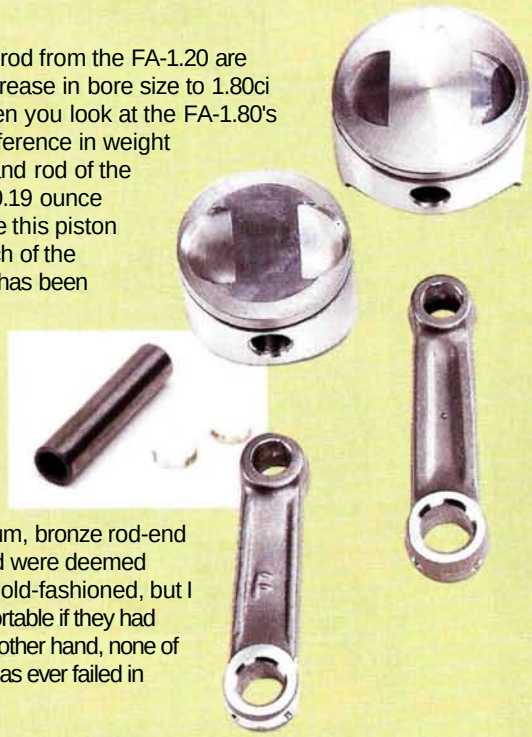
Weather conditions
Temp: 41°
Relative humidity: 44%
Barometric pressure: 30.01 in. Hg

	Rpm
APC15x8	10,150
APC 15x10	9,650
APC16x8	9,400
APC 16x10	8,640
APC17x8N	8,600
APC 18x6	8,890
T.F. Power Point 18x6	8,650
Zinger wood 18x6	7,850
APC 18x8	8,200
APC 18x10	7,600

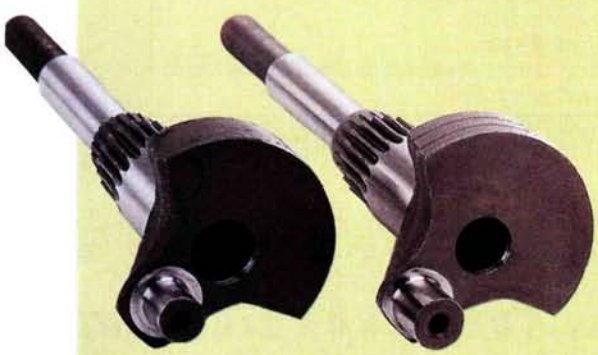
All tests were performed using 15 percent nitro Wildcat Premium Xtra fuel with 18 percent lubricant (synthetic/castor 80/20 mix) and an O.S. "F" glow plug.

The Evolution
1.20—1.50—1.80ci

Note that to compensate for the longer stroke of the 1.80, an even deeper channel than was cut for the 1.50 has been cut into the original 1.20's case in which the connecting rod's lower end rides.



Here, the piston and rod from the FA-1.20 are shown. The 4mm increase in bore size to 1.80ci is quite apparent when you look at the FA-1.80's piston (right). The difference in weight between the piston and rod of the 1.20 and the 1.80 is 0.19 ounce (5.4g). To help reduce this piston weight disparity, much of the FA-1.80's piston skirt has been removed. Both engines use hardened-steel tubular wristpins and Teflon pads (inset photo). Note that because the connecting rods are made of high-silicon forged aluminum, bronze rod-end bushings at either end were deemed unnecessary. Call me old-fashioned, but I would feel mote comfortable if they had been included. On the other hand, none of the Saitos I've owned has ever failed in these areas.



The FA-1.20's crankshaft is shown on the far left. Note that the FA-1.80's crankpin is substantially larger and is also 1.9mm farther from the center of rotation than the FA-1.20's crankpin. This results in a 3.8mm increase in stroke when both TDC and BDC radius gains are added. Crankweb/counterbalances are of the same size and thickness. Note the cam drive gear cut directly into the hardened shaft.

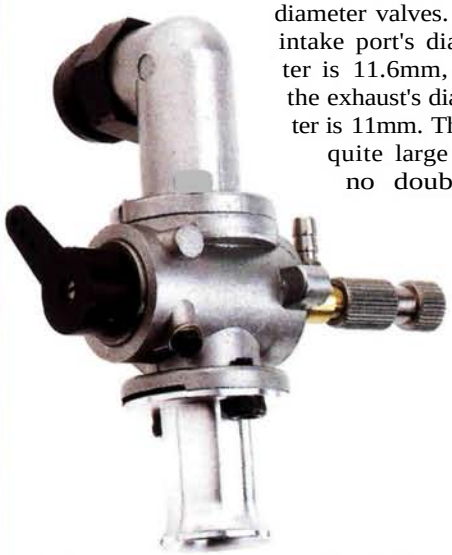
Wildcat Break-in fuel with 5-percent nitro and 20-percent oil (synthetic/castor blend of 80/20) was used for the engine's 45-minute break-in. You can put the 1.80 in an airplane and fly it rich without this much break-in; however, I wanted to prepare the engine for the leaned-out, rpm-reading portion of this review.

Here's something that's on the endangered species list: a comprehensive set of tools that's included with a new 4-stroke engine. Over the years, other manufacturers have opted to omit these items from their 4-strokes; for shame! This high-quality set includes a valve-clearance adjustment wrench and a feeler gauge. Thank you, Saito; we modelers certainly do appreciate it.

few seconds. Unless **something** is wrong, this always draws sufficient fuel for starting into the combustion chamber. Then I connect the glow power **and** start the engine at the high-idle position. You should never start any engine at high throttle, but this mistake can be especially dangerous with large 4-strokes because of the instantaneous high thrust produced by the large props they turn.

PORTING

Not only has Saito increased the displacement and carburetor venturi size, but as part of Saito's "High-Cam Series," the 1.80 also has a high-lift valve **train** with large, 15mm-diameter valves. **The** intake port's diameter is 11.6mm, and the exhaust's diameter is 11mm. This is quite large and no doubt is



The two-needle carburetor is standard on all Saito engines except for the FA-30S. The unit on the 1.80 performed perfectly, with only slight adjustments needed to the low-end needle for quick throttle response and best idle.

The One-Piece Philosophy

Some modelers are still perplexed by Saito's one-piece head/cylinder assembly. It's more expensive to machine these parts as a single piece than it is to produce a conventional, separate head and cylinder, but the one-piece design offers several advantages: no head gasket to leak; more even combustion-chamber cooling and no head bolts—and their bosses—to get in the way of intake and exhaust porting. Note the large (11.6mm) intake port (right) and 11 mm exhaust port. Porting of this size might have been impossible if a conventional bolt-on head had been used. Also note that the chrome cylinder plating is applied directly onto the aluminum-cylinder casing; no sleeve is used here. Although this is a more expensive process than applying chrome to a brass sleeve, it is a far better process for cooling and maintaining accurate piston/cylinder tolerances during heat-up and cool down. Saito's engineers know exactly what they're doing.

accomplished more easily because of the one-piece head/cylinder and resulting absence of head-bolt bosses, which leaves more room for larger porting. All of the features found on the 1.80 add up to one thing: a very powerful engine.

Of course, kickbacks and detonation can be experienced with any 4-stroke, depending on how it is handled by the user. Since the introduction of the Saito .80 back in the late 1980s, however, I can't remember having recurring problems with detonation and thrown props with any Saito, despite the engine's impressive power and extremely reliable idle. This, no doubt, is due to Saito's extensive development of the hemispherical combustion chamber used in the 4-stroke glow engine. It might also be appropriate to note that, for many years, I've run all my 4-stroke engines solely with the O.S. "F" glow plug. In my opinion, it works best.

PERFORMANCE

Saito's instructions simply state that a good-quality commercial fuel should be used for break-in; then they go on to name a few well-known brands. For all my break-in (45 minutes of running, divided into short runs), I use Wildcat's 5-percent-nitro break-in fuel with 20-percent-oil content (synthetic/castor 80/20 blend). After break-in, I switch to Wildcat Premium Xtra 15-percent-nitro fuel with 18-percent oil—also an 80/20 blend of synthetic and castor. I always use a fuel with a bit of castor in my 4-strokes because I strongly believe it protects against low-end bearing corrosion. For the first 15 to 20 minutes of the break-in, I keep the engine at or slightly under 4,000rpm. The instructions also recommend using a Hangar 9/McCoy plug. It works OK, but I'm sorry; I've found nothing that works the way an O.S. "F" plug does on any 4-stroke I've ever run, regardless of manufacturer. I do wish someone would offer a comparable plug because the O.S. unit is a bit pricey.

As you can see from the rpm chart, this is one big, powerful engine. You will need a very powerful starter. I find the ones powered by Ni-Cds have more amp-producing torque to get the job done, and there is no annoying cord that might get caught in the prop. Even with a strong starter, after priming, you will need to turn the engine backwards against compression (with the glow power disconnected) before you apply the starter to gain enough momentum to drive the engine past compression. Using this method, the 1.80 started easily every time.

The overall running characteristics of the 1.80 are quite good. Idle is very good, as is throttle transition from low to high. As I've stated earlier, the 1.80 does vibrate a bit more than the 1.20 and 1.50 but certainly not enough to bother me. Moreover, most of the noticeable vibration was in the lower ranges, especially at idle and high idle. As it's such a large single, this could actually be more power-pulse shuddering than vibration because much of it disappeared as rpm increased. I will say this: make sure you use a high-quality, machined-aluminum engine mount for this big baby. Rock-hard maple mounts that tie in to the first couple of fuselage formers would be best, but most designs today don't incorporate this type of design structure.

Intake- and exhaust-valve clearance adjustments are easy to get to when an individual rocker-arm cover is removed. Performing this maintenance is also easy with the included tools (I love those tools!).

IN CONCLUSION

Back in the mid-'80s, when 4-strokes were first becoming commercially available, they produced significantly less power than 2-strokes of equal displacement. But 4-strokes were quiet and swung large, efficient props, so their popularity increased. Today, 4-strokes are closing the power gap. They're rivaling the power advantage traditionally held by 2-strokes. This is particularly true of the Saito 1.80. This engine is right on the heels of today's most powerful 2-strokes of similar displacement—and that's running on 15 percent sport fuel. Imagine what this beast will do on 30 percent nitro! The guys at Horizon have been doing this with Saito engines for years, with no ill effects. I think it's time that I tried the 30 percent thing in some of my 4-strokes. I'll get back to you on that.

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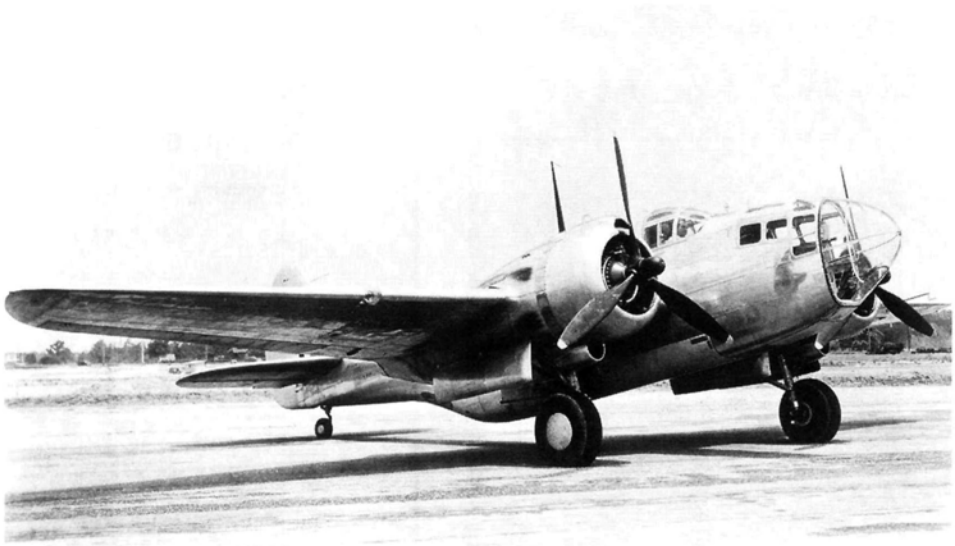
NAME THAT PLANE

Can you identify this aircraft]?



Send your anSWer to *Model Airplane News,* Name **that Plane Contest** (state issue in which plane appeared), 100 East Ridge, Ridgefield, CT 06877-4606 USA.

The winner will be chosen, four weeks following publication, from correct answers received (delivered by U.S. mail) and will be awarded a free, one-year subscription to *Model Airplane News.* If already a subscriber, the winner will be given a free, one-year subscription extension.

Congratulations to Dean M. Thompsor of Swayzee, IN, for correctly identifying the February 2001 mystery plane—th< North American AJ-1 Savage. Dean win. this month's one-year subscription *Model Airplane News.* Designed as ; carrier attack bomber, the AJ-1 Savage was powered by two 2,400hp Pratt 8 Whitney R-2800044W piston engines a: well as an Allison J33 turbojet in th< rear fuselage. It was capable of transport ing an atomic bomb and first flew ir May 1949. North American Aircraft ere ated two other versions of the AJ-1—; photographic/reconnaissance plane and

A new contest, working hatches and more

OK! Raise your hands. How many of you have had wet paint on your model the night before an event? One good way to keep our projects going is to set up a building calendar and to stick with a predetermined work schedule. This way, you don't have to burn the midnight oil the last few weeks before a contest. A little planning during the building months lets you enjoy the hobby a little more. This is especially important if you plan to fly at a contest. You have to finish a model well before an event so you can get some stick time on the new airplane. Please don't show up at a scale meet with a model you haven't flown yet. The model you save may be your own!

Scale competitions are becoming few and far between. It's good to know that there is a new event, the Connecticut Valley Scale Meet, on the calendar for 2001.

CONNECTICUT SCALE MEET

Speaking of scale meets, I am very pleased to announce the start of a new scale-model contest. Called the Connecticut Valley Scale Meet, the event is hosted by the members of the Central Connecticut Radio Control Club (CCRCC) in Farmington, CT. The CD is fellow *Model Airplane News* contributor Rick Bell. Scheduled for June 9 and 10, 2001, this new scale competition will be flown at the club's beautifully maintained grass flying field. The runway measures 650x150 feet!

Several well-known scale modelers will be involved with the event, and yours truly will also be there helping out as a flight judge. CCRCC will be simplifying things a bit by using modified, AM A 513 sport-scale rules. The main difference is that there will be no mechanical flight point awarded. Instead, the CCRCC rules will require that, if the full-size aircraft had retractable landing gear, flaps, or some other special mechanical feature, the model will also have to be so equipped to garner maximum flight realism points. Mechanical features can be demonstrated if the modeler combines them with a suitable scale maneuver. Examples of this would be lowering the flaps or retractable landing gear while doing a slow-speed flyby, dropping a bomb after a scale dive, or other prototypical maneuver. There will be a set number of mandatory and optional flight maneuvers, and static judging will be conducted before flight judging begins.

I've mentioned before that I thought that the number of U.S. scale meets has decreased, so I am really excited about this new event. If you want more information on CCRCC's Connecticut Valley Scale Meet, contact CD Rick Bell, 219 County Rd., Torrington, CT 06790; (860)489-5921; rbell02@snet.net.

AutoSpeed is a "cruise control" for model airspeed! It has a functional Pitot tube and a sensor that control your engine's throttle to prevent models from going too fast or too slow.

AIRSPEED AUTOPILOT

When you talk about Pitot tubes, you are usually referring to those little pointy objects sticking out from the model's wing. Well; what do you think about Pitot tubes that actually function? The folks from Mini Hobby ATL have come out with a neat product called the AutoSpeed. This very cool product uses a Pitot tube and an automatic speed-control device to limit the model's maximum and minimum airspeeds, thus enhancing flight safety.

According to company owner Antonio Tahan, AutoSpeed uses a microprocessor and an air-pressure sensor to measure the model's airspeed. It then adjusts the throttle to keep the model within a modeler-determined speed range while the unit is in the "automatic" mode. The automatic mode can be turned on or off with an auxiliary channel, or it can be actuated by using the throttle stick.

Both ducted-fan and turbine-powered aircraft are capable of very high speeds and might go so fast that the stress on an airframe could cause structural damage. With the AutoSpeed activated, if the aircraft's speed goes above the maximum preset value, it will reduce engine power until the airspeed drops below that value. If the model flies too slowly and is in danger of stalling, the unit will increase power. Manufacturers such as BVM have published Vne (velocity to never exceed) figures for their model jet kits. With the AutoSpeed unit, safe operating speed ranges can be developed, and this will make ducted-fan and turbine flying much safer for everyone.

I have also been told that Mini Hobby ATL is about to introduce a new unit called AutoProp for use with propeller-driven airplanes. Very cool indeed!

WORKING HUTCHES

Figure 1. Cutting out a hatch cover

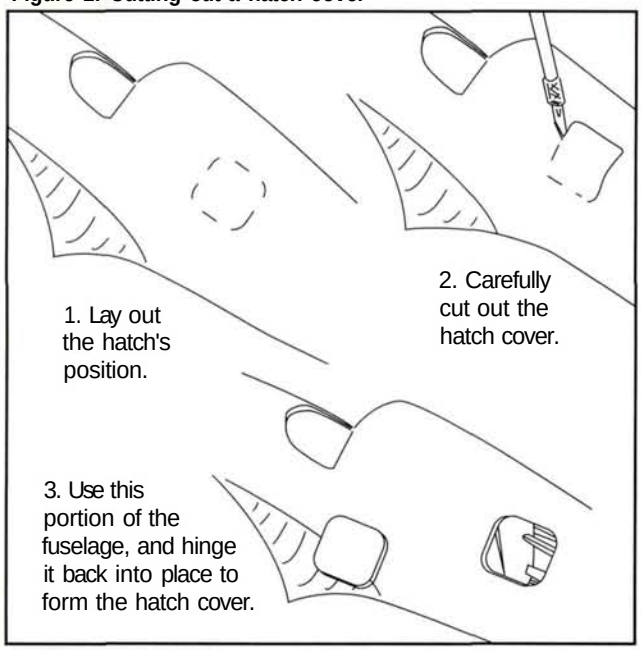


Figure 2. Fiberglass layup for hatch cover

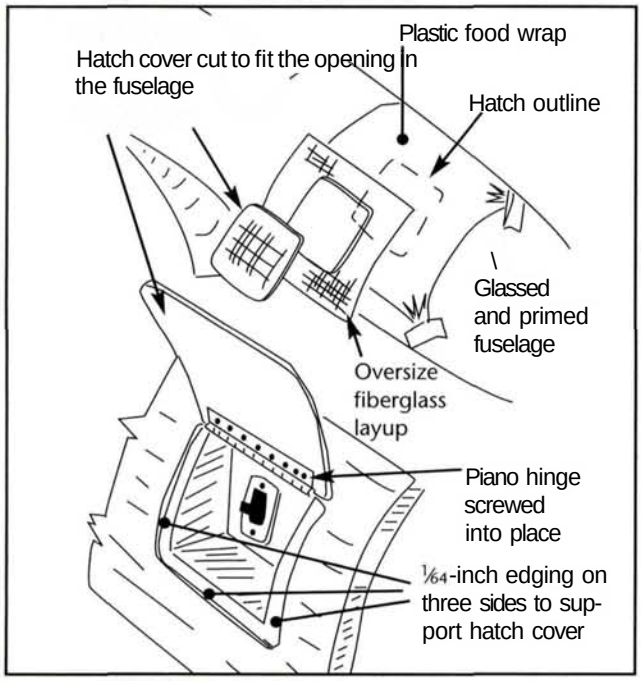
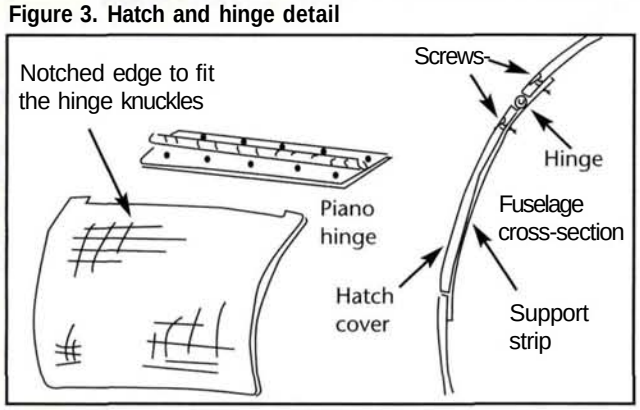
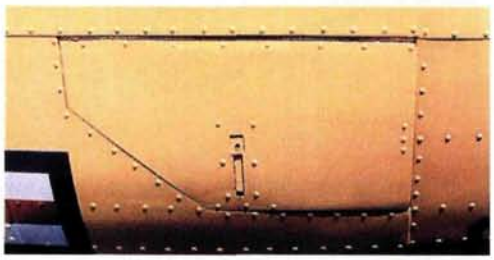


Figure 3. Hatch and hinge detail





While most scale modeling subjects have hatches and latches and panel lines, modelers tend to use them as "decorations" only. Typically, they aren't functional. Hatches that open and close, however, come in handy to hide non-scale items such as switches, fuel fittings and air valves. Working hatches greatly improve the scale look of your plane.

When I make an operational hatch, I usually take into account where to put it on the aircraft with regard to its structural integrity. I don't recommend putting a hatch around your tail/stab/fin area on the fuselage, as this is a high-stress area, and you wouldn't want to weaken it. The area from just behind the wing saddle to the firewall is ideal for functional hatches.

While building my plane, I take into account where I want to place hatches, and I make sure there won't be any structures such as stringers or bulkheads to get in the way. It's really a drag to have to cut into a 1/4-inch thick plywood bulkhead to install a properly positioned hatch. Plan ahead! After the fuselage is covered with glass cloth and resin, sanded smooth and primed, I start by outlining the exact location of the hatch. Use a fine-tip ballpoint pen or felt-tip marker to make the lines easy to see. From this point, there are two ways to proceed. You can either carefully cut out the opening and use that piece of the fuselage as the movable hatch (Figure 1), or you can lay up a few layers of fiberglass over the hatch area, and when it cures, use it to make the hatch cover (Figure 2). This is the same basic technique that master modeler Dave Platt uses to make landing gear doors that fit perfectly.

The hatch must have the same contour as the fuselage so it can operate correctly and look right. Once you have the movable part of the hatch, you have to add a hinge and the edging under the opening to support the cover when it's closed. These pieces also help stiffen the fuselage around the cutout.

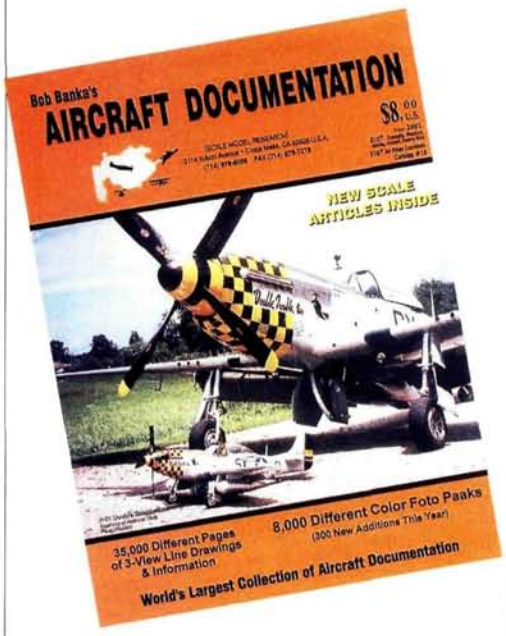
You can use a standard, flat nylon hinge, but I recommend the piano hinge from Nelson Hobby Specialties because it's easy to work with, and more important, it looks scale. Jerry Nelson sells piano hinges that are up to 30 inches long. The hinges are made of 0.017-inch-thick, brass-plated, mild steel and are available in 3/8-, 1/2- and 5/8-inch widths.

Position the hinge along the opening in your fuselage, and mark its length; cut it and attach it to the fuselage. It does not have to be the entire width of the opening, but it should be close. I usually drill through the fuselage into the hinge and hold it in place with flathead or countersunk sheet-metal screws. The advantage of using screws is that I can remove the hinge and hatch later, if needed.

Before you attach the hinge to the movable hatch, trim away some hatch material to about the same width as the diameter of the exposed part of the hinge knuckles (Figure 3). Once you have a good fit, drill through the hatch into the hinge flange and attach it with screws, as you did earlier. You may have to remove the hatch from the hinge a few times so you can trim it to the exact size needed for a precise fit into the hatch opening. Take your time, and work slowly, filing and sanding the hatch cover until it's perfect.

To hold your hatch closed, you can use hatch-latch pins available from both BVM and Hobby Lobby. You can also make your own, as I outlined in my April 1999 column. You could also use a magnet, but that's a technique for another column!

I have included photos of the scale hatch that Bill Steffes added to his giant AT-6 Texan. His hatch is in a very obvious scale position, just aft of the canopy on the fuselage's left side, and it's used to access Bill's radio on/off switch, engine choke switch and air-cylinder filler valve. Bill also took the time to make a very scale-looking latch mechanism. Very authentic looking! Give this technique a try on your next scale project; it takes a little time, but the reward is great.



Bob Banka's newest documentation catalog is out, and it's a big one!

AIRCRAFT DOCUMENTATION

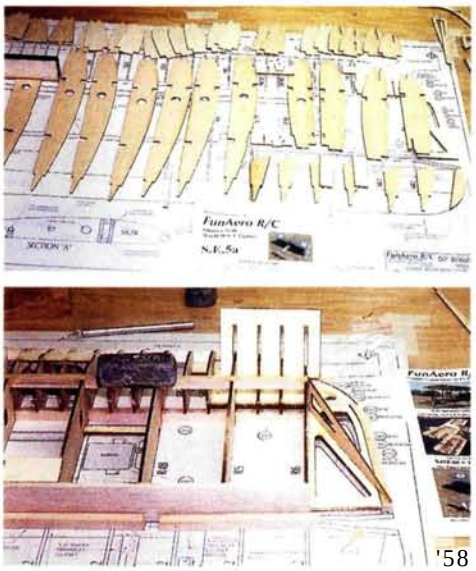
Bob Banka's Aircraft Documentation (formerly known as Scale Model Research) has just sent me its latest catalog. The company continues to grow, and its catalog is bigger and better than ever. The 2001 issue has 250 pages and lists over 8,000 Foto-Paaks, 35,000 3-view drawings and nine scale technique articles—even one written by me!

The Foto-Paaks are packages of 31^x5-inch color photos showing aircraft details, paint schemes, markings, instrument panels, landing gear, control surfaces, etc. I have been dealing with Bob for many years, and I enjoy his work, enthusiasm and attention to detail. Pick up his catalog; you won't regret it.

FUNAERO SE5A UPDATE

Not too long ago, I mentioned a new V4-scale SE5a from FunAero R/C. One thing has led to another, and I now have the deluxe version of the kit on my building board. This kit is more complete than I had ever expected, and the laser-cut wood parts are something to behold. The instruction manual is very well-written, and the pictures and drawings are just great. The CAD-drawn plans are precise, and all the parts fit perfectly. You won't have to do any minor trimming to make things go together correctly.

The kit even has laser-cut jigs and gauge blocks so you can correctly position the various pieces. I'm going to power my SE5a with a Zenoah G-38, but if you want to do easy aerobatics, then a G-45 would be a better choice. With an 80-inch span, the model is impressive and inspiring. I will keep you posted as I put together this great WW I British biplane. You might even see it at the Connecticut Valley Scale Meet in June!



I'm well into the construction of my new FunAero R/C SE5a WW I biplane. This CAD-designed and laser-cut kit is a joy to build. There are even laser-cut alignment jigs in the kit to properly align various pieces.

Bob Banka's Aircraft Documcntion, *3114 Yukon Ave., Costa Mesa, CA 92626; (714) 979-8058.*
Bob Violett Models (BVM), *170 State Rcl. 419, Winter Springs, FL 32708; (407) 327-6333; fax (407) 327-5020; bvmjets.com.*
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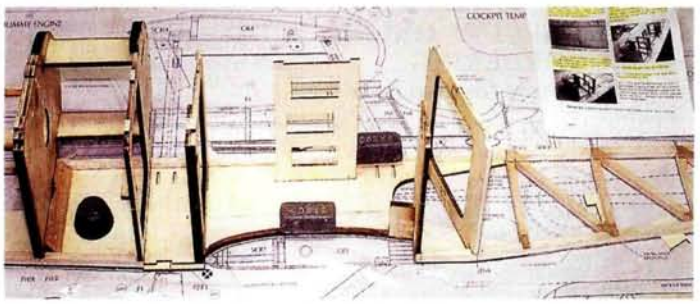
Zenoah, *4105 Fieldstone Rd., Champaign, IL 61822; (217) 355-9511; www.horizonhobby.com.*



Here, the fuselage of the FunAero SE5a takes shape; note the laser-cut servo tray.

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WANTED: the old Sterling Company PT 17 Stearman, 65-in. wingspan. Charlie, (905) 371-8488. [5/01]

MODEL AIRPLANE NEWS (ISSN 0026-7295, USPS 533-470) is published monthly by Air Age Inc., 100 East Ridge, Ridgefield, CT 06877-4606 USA. Periodical postage permit paid at Ridgefield, CT, and additional mailing offices.

SUBSCRIPTIONS. U.S. and Canada, call (800) 827-0323; elsewhere, call (815) 734-1116. Or set your Web browser to www.airage.com/subscribe.html. U.S.: $34.95 (one year), $55.95 (two years). **Canada:** $49.95 (one year), $87.95 (two years), inc. GST, reg. no. 13075 4872 RT. **Elsewhere:** $48.95 (one year), $83.95 (two years). Prepayment required; Visa, MC and AmEx accepted.

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FINAL APPROACH

BY JERRY NELSON

A world-class Avro

When modeling aces from 25 countries gathered in Interlaken, Switzerland, for the 2000 World Scale Championships, Swiss aviator Andreas Luthi nearly swept the competition. Overtaking his rivals in the F4C (RC scale) competition and the F4 (giant-scale) open event, he established himself as one of the few competitors who could dominate this world-class competition.

For 2000, dozens of accomplished modelers arrived in Switzerland with a gamut of models that represented nearly all of aviation history—from a 1910 Avro to a modern McDonnell Douglas F-15. Most of the pilots had to qualify in a national competition in their own countries; for instance, the pilots of the American team qualified at a special event just before the AM A 1999 Nationals held in Muncie, IN. In all, 59 pilots from 25 countries entered the competition, while another 20 aircraft took part in the open giant-scale event.

Each score in the F4C comprised flight performance, realism and the plane's accuracy to original outline. For the overall score, the judges averaged the scores of the best two of three flights and combined this number with a pilot's static score.

For the competition, Andreas used his replica of an original vintage Avro Triplane, complete with cable rigging and a painstakingly detailed engine. The model also has spruce longerons reinforced with inlaid carbon fiber for strength and is powered by a Laser 1.50 4-stroke engine. All told, the Vn-scale aircraft took him five years to build. Andreas first flew the plane at the 1998 World Scale Championships in South Africa, in which he placed second overall and, having come so close to the gold, he was picked as the favorite for the 2000 event. In Switzerland, he placed second in the static judging; however, the flight scores proved that this aircraft's performance matched its persona. With little or no wind sweeping through the mountain valley, Andreas was able to demonstrate the Avro's realistically slow and steady flying style. He delivered a strong flight performance that—despite a second best and impressive static score—would ultimately weight his overall score enough to pull him ahead of the runner-up and into the winners' circle.

SPECIFICATIONS

Model: Avro
Type: 1/4-scale triplane
Length: 92 in.
Wingspan: 95.2 in.
Weight: 17.61b.
Engine used: 25cc Laser 4-stroke
Prop used: 18x6
Radio used: Graupner/JR MC-24

Also taking part in the open, giant-scale event, Andreas flew a very detailed V-i-scale Bucker Jungmeister. He took first place with such maneuvers as 4-point rolls and low-level knife-edge flight. His realistic use of throttle also added to his flight scores. Andreas clearly is a force to contend with in any aerobatic competition.

The next world championship will be held in Canada in 2002, and it's rumored that Andreas plans to build a WW II warbird. If he can pilot that plane the way he has flown his Bucker, that field of modelers will have their work cut out for them. ±